

System 800xA Engineering

Engineering and Production Environments

System Versions 6.0

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About this User Manual

General



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

This User Manual describes how to engineer configuration information in environments and use the Configure and Deploy, and Load Evaluate Go features.

User Manual Conventions

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

Feature Pack

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

Feature Pack Functionality

<Feature Pack Content>

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

*Feature Pack Functionality

Feature Pack functionality in an existing figure is indicated using callouts.

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

Warning, Caution, Information, and Tip Icons

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



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



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



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



Information icon alerts the reader to pertinent facts and conditions.



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

Although Warning hazards are related to personal injury, and Caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result

in degraded process performance leading to personal injury or death. Therefore, fully comply with all Warning and Caution notices.

Terminology

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

Term/Acronym	Description
Environment difference report	A report that details any differences found between two environments.
Evaluation report*	A report that details any alarm, access variable, communication variable output, and I/O channel output differences between the active and passive applications running in the controller.

* [Feature Pack Functionality](#)

Released User Manual and Release Notes

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

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

- Included on the documentation media provided with the system and published to ABB SolutionsBank when released as part of a major or minor release, Service Pack, Feature Pack, or System Revision.

- Published to ABB SolutionsBank when a User Manual or Release Note is updated in between any of the release cycles listed in the first bullet.



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

Section 1 Introduction

Overview

This instruction describes the environments concept and how to perform engineering and configuration tasks between 800xA systems and the different environments within a fully configured, environment-enabled (also called versioning-enabled) system. Typically the Production Environment in the Production System controls the plant process while the Engineering System (or the Engineering Environment in the Production System) is used to make and test modifications. It is then possible to transfer the modified application to the Production Environment using one of three methods. Refer to [Configuration Transfer Methods](#) on page 15 for more information about the methods.

Typical System Layout

The typical arrangement of systems and configuration methods are shown in [Figure 1](#), [Figure 2](#), and [Figure 3](#). The Engineering System is not required.

It is also possible to configure within one system (the Production System) or in a completely isolated system and import the changes into the Engineering System.

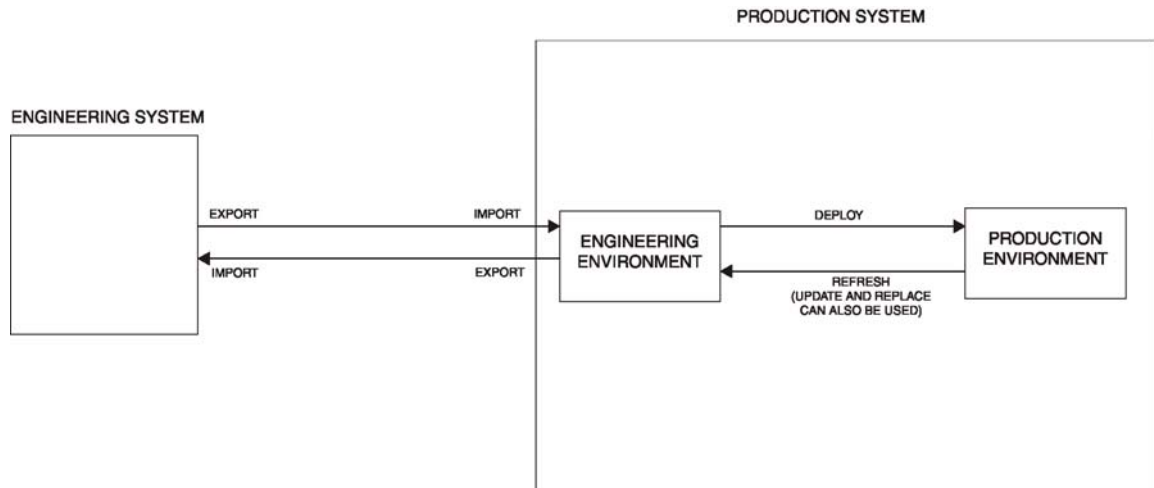
Configuration Transfer Methods

There are three methods for transferring configuration information from the Engineering System to the Production System. These methods are:

- Configure and Deploy.
- Load Evaluate Go.
- Configure and Refresh.

Configure and Deploy

A typical system using the Configure and Deploy method is shown in [Figure 1](#).



T05296A

Figure 1. Typical System Using Configure and Deploy

This method consists of:

1. Exporting the information from the Engineering System.
2. Importing the information into the Engineering Environment of the Production System.



Changes can be made in the Engineering Environment without affecting the Production Environment.

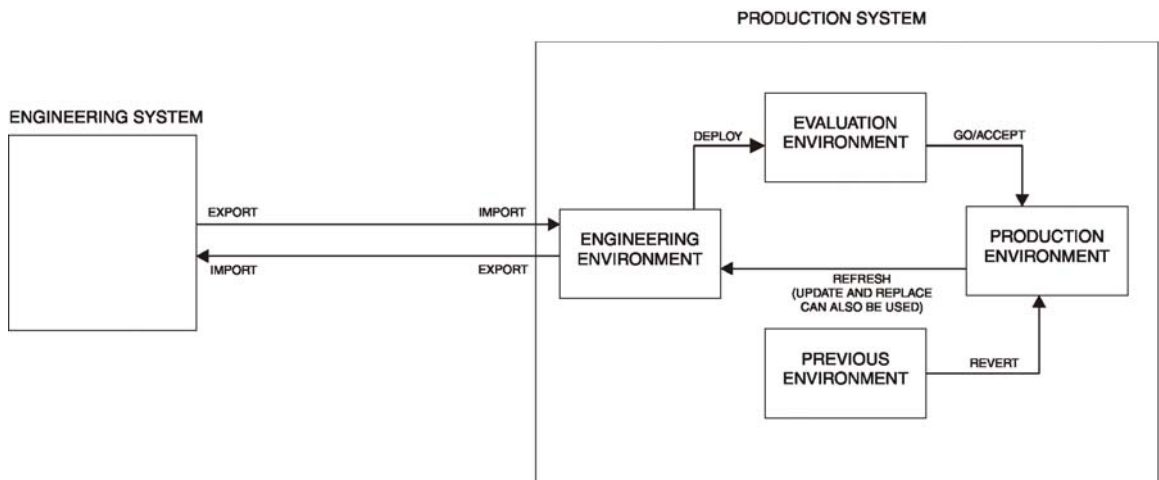
3. Deploying the information from the Engineering Environment to the Production Environment for immediate execution.
4. Making the information in the Engineering Environment identical to that in the Production Environment using the Refresh function.

5. Exporting the information from the Engineering Environment of the Production System.
6. Importing the information into the Engineering System.

Refer to [Section 4, Configure and Deploy](#) for more detailed information about this method.

Load Evaluate Go

A typical system using the Load Evaluate Go method is shown in [Figure 2](#).



T05291A

Figure 2. Typical System Using Load Evaluate Go

This method consists of:

1. Exporting the information from the Engineering System.
2. Importing the information into the Engineering Environment of the Production System.



Changes can be made in the Engineering Environment without affecting the Production Environment.

3. Deploying the information from the Engineering Environment to the Evaluation Environment.
4. Downloading the information (application) to the controller for evaluation. The application is executed in parallel to the production information.
5. Evaluating the information and (if it functions correctly) making it the temporary production information using the Go function. The original production information is saved in the Previous Environment for immediate retrieval using the Revert function.
6. Accepting the temporary information as the production information.
7. Repeating [Step 3](#) through [Step 6](#) until all changes have been moved into the appropriate controllers.
8. Making the information in the Engineering Environment identical to that in the Production Environment using the Refresh function.
9. Making the information in the Production and Engineering Systems identical by:
 - a. Exporting the information from the Engineering Environment of the Production System.
 - b. Importing the information into the Engineering System.

Refer to [Section 5, Load Evaluate Go](#) for more detailed information about this method.

Configure and Refresh

A typical system using the Configure and Refresh method is shown in [Figure 3](#).

This method consists of:

1. Exporting the information from the Engineering System.
2. Importing the information into the Production Environment of the Production System for immediate execution.
3. Making the information in the Engineering Environment identical to that in the Production Environment using the Refresh function.

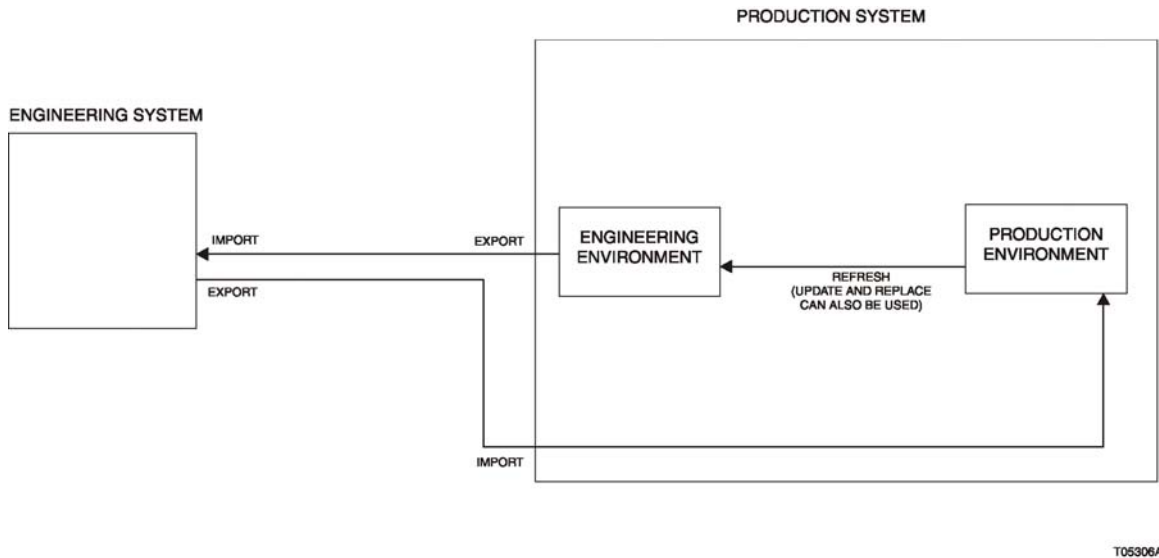


Figure 3. Typical System Using Configure and Refresh

4. Exporting the information from the Engineering Environment of the Production System.
5. Importing the information into the Engineering System.

Refer to [Section 6, Configure and Refresh](#) for more detailed information about this method.

Combining Transfer Methods

The Configure and Deploy and Load Evaluate Go methods can be used together. The Configure and Deploy method can be used to move Engineering Environment changes to the Production Environment (but not downloading changes to controllers) without immediately affecting ongoing operations. The Load Evaluate Go method can then be used to download, evaluate, and accept or reject the changes.

Section 2 Engineering Concepts

Introduction

This section discusses the concepts of environments, entities, reservations, and security definitions and how they apply to engineering within and between environments.

Environments

In 800xA Systems, it is possible to have different environments that may hold different versions of an aspect. This means that several versions of an aspect can exist at the same time in the same system ([Figure 4](#)). Each environment defines which version of each aspect is current and visible in that environment.

Environments allow isolated engineering which makes it possible to modify an application without an immediate impact on the functions that are controlling and supervising the process.

The basic combination of environments is to have one Production Environment and one Engineering Environment (refer to [Production Environment](#) on page 25 and [Engineering Environment](#) on page 25). The normal starting point of an engineering session is that the Engineering System and Production System environments (Production and Engineering) are exactly identical. Refer to [Figure 1](#), [Figure 2](#), and [Figure 3](#) for examples of typical systems. The typical first step is to modify an application in the Engineering System (or Engineering Environment in the Production System).

When an aspect is modified in one environment, a new version of the aspect is created in that environment and the changes are kept isolated from all other environments. All users working in the same environment will see the changes made by all other users.

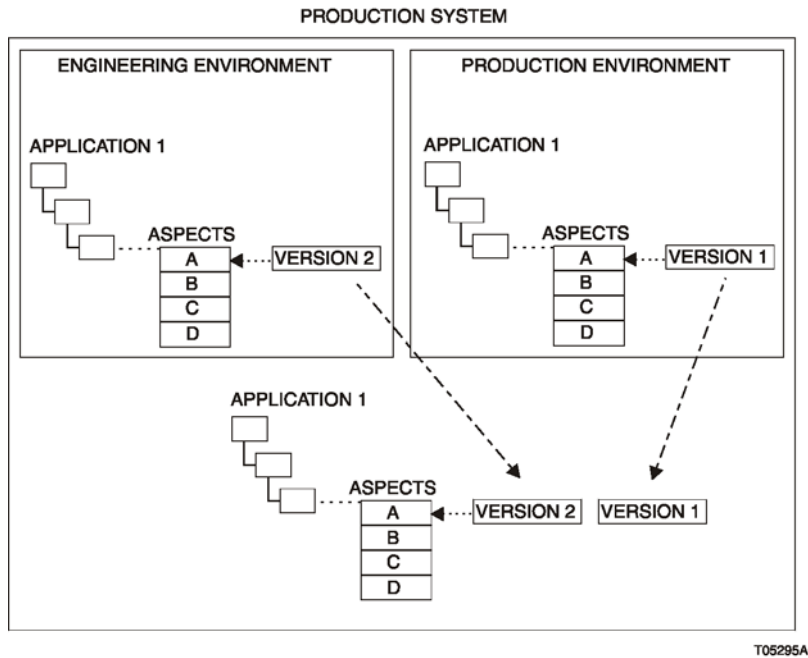


Figure 4. Environments

Certain aspects can only be created, changed, or deleted in the Production Environment. However, these aspects (production-only) are visible in all the environments. The Approved Procedure, Service Group Definition, and User Definitions aspects are examples of production-only aspects.

It is possible to make changes in the Production Environment in parallel with changes made in the Engineering Environment. To ensure that the information in the Engineering Environment is identical to that in the Production Environment, the Engineering Environment may need to be updated from the Production Environment. This can be done using the Update, Replace, or Refresh (most common method) functions.

When the Engineering Environment contains the desired information, transfer the information to the Production Environment using the Deploy operation. For example, after deploying a modified application from the Engineering Environment to the Production Environment, the latter will no longer contain the running

application. Instead, the Production Environment will contain the modified application which can now be downloaded to the controller. Refer to [Deploy](#) on page 28 for more information.

Environments exist in combinations. For example, four environments are used when performing Load Evaluate Go functions. All environments are always dependent on the Production Environment.



The Plant Explorer will only show information of the environment in which it is used.

Complete as much as possible of the system engineering and configuration tasks such as adding users, adding server and client nodes, loading system extensions, configuring redundancy and affinity, etc. before support for environments is enabled.

Support for environments is enabled from the Configuration Wizard (Environment setup step) by selecting Configure-Deploy Support (Figure 5). This option must be

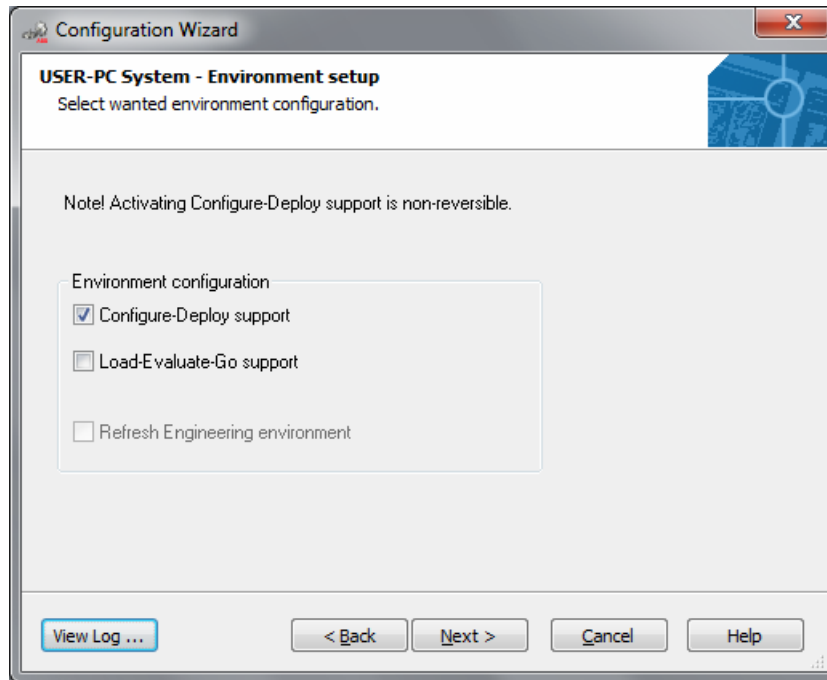


Figure 5. Environment Setup

enabled before the Configure and Deploy, and Load Evaluate Go functions can be used. Only a user that is the local administrator on the workstation and has Administrate permissions in the Admin structure can enable support for environments. To use the Load Evaluate Go function, enable the Load-Evaluate-Go Support option.



A separate license option is required to enable Environment support in System 800xA.



In order to enable support for environments all aspects in the system need to be Environment Aware (proven to work in a system with environments). In some cases systems upgraded from 800xA 5.0 systems contain aspects that are not Environment Aware. An attempt to enable environment support will be blocked and a list of the non environment aware aspect types will be presented. These aspect types and instances from these aspect types need to be removed from the system before support for environments can be enabled.

Production Environment

The Production Environment is the only environment that is always present in a system. This environment normally represents the current approved state of the system (the solution running in the controller and the graphics, alarm lists, trend displays, etc. used by the Production System). The Production Environment is used to download a project (or a single application) to the controllers and go online. This is the environment the operators use to monitor and interact with the plant processes. The Production Environment content will differ from controller content after a deploy operation and before downloading to the controller.

Before an aspect is transferred into the Production Environment, it must be tested to ensure that the Production Environment is kept consistent. The Configure permission is required to allow the deploying (moving) of aspects into the Production Environment (refer to [Deploy](#) on page 28). Use this and other permissions to restrict the number of allowed users to a small group and limit the operations they can perform.

While changes are being made in the Engineering Environment, changes made in the Production Environment should be limited to only those that are absolutely necessary.



The I/O channel assignment supports only one environment for the engineering work of HART devices. Use of the Production Environment is preferred.

Engineering Environment

The Engineering Environment represents an area where modifications of an application can be performed and tested (Control Builder Test Mode - no downloading to SoftController) in isolation from the Production Environment. The normal way to make the Engineering Environment identical to the Production Environment is to use the Refresh function. The Update and Replace functions can

also be used. Refer to [Update](#) on page 31 and [Replace](#) on page 33 for more information.

When the changes have been verified to work correctly, the changes (or modified applications) are moved either directly to the Production Environment (Deploy function) or to the Evaluation Environment (Deploy function of Load Evaluate Go).



In the Engineering Environment, device type manager (DTM, part of PROFIBUS/HART systems) configuration data is not automatically stored in the Aspect Directory even if the DTM is closed.

Release the project at least once before starting the Deploy function to save all device configuration data of the DTM to the Aspect Directory.



The OPC Server PROFIBUS/HART cannot be configured in the Engineering Environment. Any open DTM needs to be closed prior to deployment of the hosting Entity (for example, AC800M Controller).

Evaluation and Previous Environments

When using Load Evaluate Go, two additional environments named Evaluation and Previous are used. These environments are read-only and have special rules regarding their use. If Load Evaluate Go is enabled, the Evaluation and Previous Environments are automatically created when the Load Evaluate Go session is started and deleted when the Load Evaluate Go session is terminated (by the Accept or Abort commands). However, environment support must be activated to be able to start a Load Evaluate Go session.

Navigating Environments

Environments are supported in different applications. Each of these is explained below.

Plant Explorer

The system login window allows selection of the environment to be used, provided you hold the Enter Environment permission. A user preference identifies the default environment to use. The user may need to create shortcuts for each environment from the ABB Workplace Login window.

Plant Explorer connected to a non-production environment clearly indicates it with the environment name in the title and a colored information bar under the title.

Control Builder

Control Builder can operate against one environment at a time. It is possible to have more than one Control Builder running against an environment if they are connected on separate workstation nodes. It is also possible to attach (go online without download) Control Builder to a controller during a Load Evaluate Go session involving the specific controller. This can be done for either versions of the application. However, only one Control Builder can control the Load Evaluate Go progress and look at the Online Evaluation Report at a time.



Only one Control Builder M can be opened per user on an 800xA node.

Bulk Data Manager

The Bulk Data Manager automatically senses the current system and environment when it is started from the context menu in the Plant Explorer.

To select the system and environment in the Bulk Data Manager that was started from the **ABB Start Menu** (For more information about the ABB Start Menu refer *System 800xA, Tools (2PAA101888*)* manual):

1. Click **No System**.
2. Select the system in the Systems field of the Attach System window.
3. Select the environment in the Environments field.
4. Select the required structure in the Structures field.
5. Select a start object in the structure using the browser provided. and click **OK**.

Propagating Changes

There are several ways to move changes between systems and environments:

- Export and Import/Engineering Repository.
- Deploy.
- Update.

- Replace.
- Refresh.

A report (Environment Difference) is also available to compare environments for differences.

Export and Import/Engineering Repository

The 800xA System Export and Import functions are described in detail in the *System 800xA Engineering, System Maintenance Instruction (3BSE046784*)*. Use these functions to export applications from one system to an archive file (.AFW) and then import the applications (in the .AFW file) into another system. This usually happens from the Engineering System to the Production System. The Export and Import functions are available from the **Start** menu and a button in the Plant Explorer.

The engineering repository is a tool for transferring data from an engineering system to the production system. The engineering repository consists of an application server to which engineering solutions from an engineering environment and associated production environment can be saved, compared, and retrieved. The engineering solutions that can be saved are control projects, control applications, controllers, and libraries. These capabilities are available from the Plant Explorer (through context menus) and Engineering Repository Browser windows.

The engineering repository server provides these services to 800xA System nodes using the Windows IIS service. Engineering solutions are handled as AFW files and the meta data is also stored in order to better store and retrieve AFW files.

An engineering solution AFW file retrieved from the engineering repository can be used in place of the exported configuration information from an Engineering System in the Configure and Deploy method.

Deploy

When a number of items (aspects, objects, entities, etc.) have been changed in the Engineering Environment and its time to make these changes available in other environments, the changes must be deployed. The Deploy operation moves all items selected in the Engineering Environment directly over to the target environment. This means that the existing items in the target environment will be replaced by the

new and/or changed items. The Deploy operation moves changes between the Engineering Environment and the Production or Evaluation Environments.

Some items (called production-only) are write protected in all environments except for the Production Environment. The Approved Procedure, Service Group Definition, and User Definitions aspects are examples of production-only items. These production-only aspects can only be changed in the Production Environment, and therefore it is important to perform an Update or Replace before the Deploy (refer to [Configure and Deploy](#) on page 48) to avoid losing Production Environment changes made during the Deploy operation.



Be absolutely certain that no important items will be lost from the Production Environment before deploying. The Environment Difference report can be used to determine this.

The Deploy operation can be performed using the Deploy function which is started by right clicking the item to be deployed in Plant Explorer in the Engineering Environment and choosing **Manage > Deploy** *item_name* from the context menu. The Deploy function can also be started by clicking the Launch Deploy Tool button in Plant Explorer in the Engineering Environment ([Figure 6](#)).

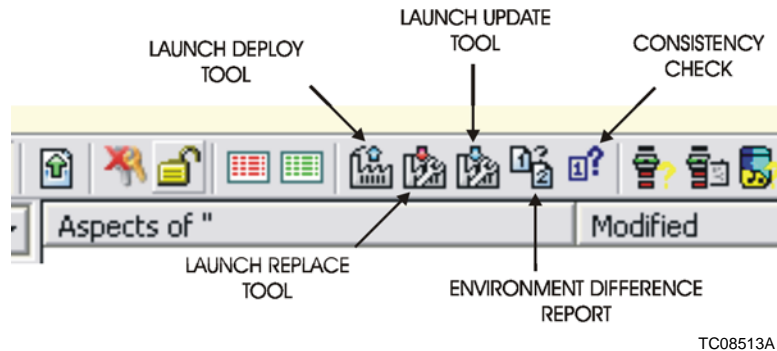


Figure 6. Deploy, Update, Replace, and Consistency Check Buttons

[Figure 7](#) shows the Deploy window as it would appear after using the Launch Deploy Tool button. The Deploy window will contain the selected item when opened from the context menu. Click **Add Item** to add other items to the list of items to be deployed. [Table 1](#) shows the items that can be deployed and the required deployment options.

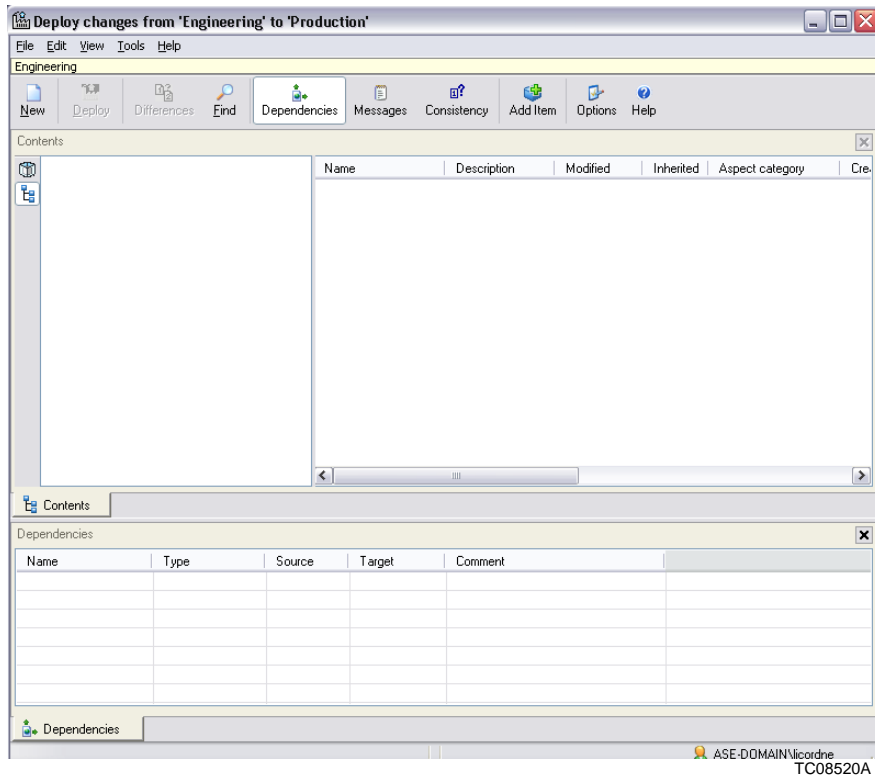


Figure 7. Deploy Window

In a Load Evaluate Go session, the Deploy operation replaces the application in its entirety, which means that if items in the deployed application are deleted in the source environment, they will also be deleted in the target environment. When performing Deploy in a Load Evaluate Go session, the target environment is the Evaluation Environment.

When using two environments (Configure and Deploy), the Deploy operation replaces selected entities. The target environment is the Production Environment.

If a selected item has been modified in the Production Environment since the last update to the Engineering Environment, the Deploy tool prompts for an Update to be done.

Table 1. Items That Can Be Deployed

Deployable Item	Enabled Options		
	Include Dependencies	Include Children	Include Extensions
Entire control application	X ¹	X	
Entire controller	X ²	X	
Substructure of Functional Structure	X ³	X	
Control project			

NOTES:

1. For items such as libraries.
2. For items such as applications and the dependent libraries.
3. For items such as trend templates and alarm and event list configuration.

Several applications (AC800M control for example) may have been modified in the Engineering Environment but only one can be deployed at a time when performing Load Evaluate Go. Only one application can be downloaded in one Load Evaluate Go session. However, Configure and Deploy allows several applications to be changed and deployed all at the same time.

A reserved single aspect that is to be deployed will automatically be released before it is deployed. Refer to [Reservation](#) on page 37 for more information about reservations.

Update

The Engineering Environment is typically initially created as a copy of the entire Production Environment. However, there is a possibility that someone has changed an aspect in the Production Environment while modifications were being made to the Engineering Environment. To make sure that no important aspect modifications in the Production Environment are lost when deploying from the Engineering Environment to the Production Environment, use the Update function to merge any changes before Deploying. Merging means that aspects and objects are copied into the Engineering Environment (from the Production Environment) but other changes are not removed. For example, if items in the source substructure in the Production Environment have been deleted, the updated substructure (in the Engineering

Environment) will still contain the deleted information. Update should always be done before deploying, but can also be performed at any point in time.

The Update operation can be performed by clicking the Launch Update Tool button in Plant Explorer (refer to [Figure 6](#)). The Update function (when updating a complete application) can also be started by right clicking the application in Plant Explorer and choose **Manage > Update** *application_name* from the context menu. [Table 2](#) show the items that can be updated and the required deployment options.

Table 2. Items That Can Be Updated

Updateable Item	Enabled Options		
	Include Dependencies	Include Children	Include Extensions
Entire control application		X ¹	
Entire controller		X ¹	
Substructure of Functional Structure			
Control project		X ¹	

NOTE:

1. For the Operator Notes and Security Definition aspect categories.

It is possible to selectively update items such as entities, entity extensions, and single objects, applications, and aspects (all except Control Builder related aspects). Control Builder related aspects must be replaced however, other aspects that are part of Control Builder entities can be updated. An error message is displayed when an update is performed if an improper aspect is selected. Within this scope, the Update function creates a difference report (refer to [Environment Difference Report](#) on page 34) listing all items that have been modified in the Production Environment since the Engineering Environment was created (or since last updated).

Where applicable, differences are shown at the entity level (refer to [Entities and Entity Extensions](#) on page 34). To view the details, expand the entities. Individual items to be updated can then be selected. This selection can also be done at an aspect level, to avoid replacing modified entities in the Engineering Environment with the entire old entity from the Production Environment. It is recommended that an environment difference report be run before an update to confirm which changes

will be done. To update a single aspect, click the Launch Update Tool button to open a blank Update function window. Drag the aspect of interest into the Update window and click **Update**. The Update operation will transfer all selected items from the Production Environment to the Engineering Environment.

Replace

Replace functions like the Update function except that it deletes the selected information and replaces it with the corresponding information from the Production Environment. This function is typically used to undo changes. For example, if items in the source substructure in the Production Environment have been deleted, the replaced substructure (in the Engineering Environment) will also have the same deletions.

The Replace operation can be performed by clicking the Launch Replace Tool button in Plant Explorer (refer to [Figure 6](#)). The Replace function can also be started by right clicking the application in Plant Explorer and choose **Manage > Replace application_name** from the context menu. [Table 3](#) show the items that can be replaced and the required deployment options.

Table 3. Items That Can Be Replaced

Replaceable Item	Enabled Options		
	Include Dependencies	Include Children	Include Extensions
Entire control application	X	X	
Entire controller	X	X	
Substructure of Functional Structure		X	
Control project			
Library	X		

In order to replace objects or aspects within a control entity, the entire entity must be replaced.

Refresh

Select **Tools > Advanced > Refresh engineering** in the Environment Difference Report window to delete the whole Engineering Environment and replace it with a new Engineering Environment that is identical to the Production Environment. Verify that there are no reserved single aspects in the Production Environment before using the Refresh function. For more information refer [Security](#).

Environment Difference Report

An Environment Difference Report is a report specifying what is different between the two environments. This report contains the following information:

- All aspects that have been added, modified, or deleted, including information about the environments in which they were changed. Changes in both environments are presented as conflicts
- A difference description.

Remove Environment Changes

When entering the Engineering Environment, the projects may already contain changes. To start working with same the projects (and all other information as well) as in the Production Environment:

- Refresh the Production Environment to the Engineering Environment. Ensure that no other user will be affected before performing the Refresh operation.
- *or* -
- Replace only the entities, objects, single aspects, etc. that need changed.

Entities and Entity Extensions

An entity is a set of objects that are treated as a single unit. The entity concept makes it easier to understand which parts will be affected by a change and also lets the system applications know which parts that must be handled as a unit.

An entity is typically defined as a sub-tree in a structure, such as the Control or Type structures (refer to [Figure 8](#)). The top level object has an aspect that defines the entity and the entity includes all descendants.

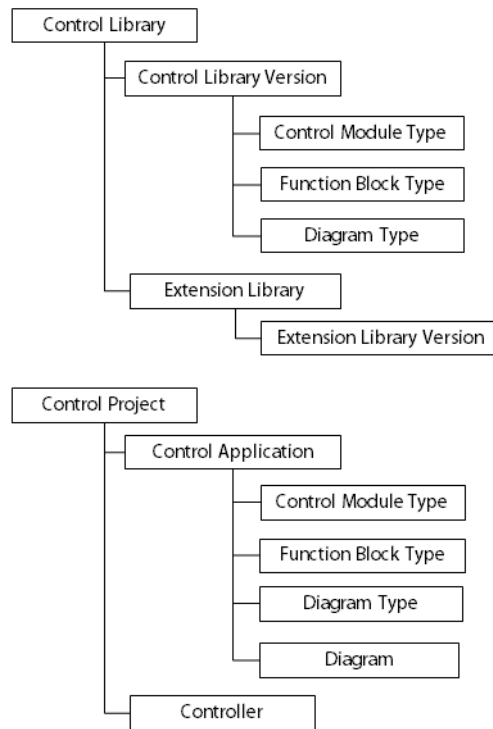


Figure 8. Entity Examples

Entities can be nested (include other entities). For example, applications and controllers are parts of a control project. Control module types and function block types are parts of either an application or a library. The hierarchy is strict which means that each object and entity can only be a direct part of one entity.

When a new version of an entity is imported into a system where an old version of it already exists, the existing entity will be replaced in its entirety. There are no merge possibilities. Hence, importing an entity may cause objects and aspects to be deleted, as opposed to when individual objects and aspects are imported. Likewise, when an entity is deleted, all its contained objects and aspects are deleted.

An entity extension is a group of objects and aspects that can be added to an entity.

Entity types and Entity Extension are predefined by the core system and by system extensions as defined in [Table 4](#).

Table 4. Entity Types and Entity Extension Types

Entity Type	Definition
Library, library version, extension library, and extension library version.	<p>A library can contain multiple versions in the library structure. Each of these versions includes a set of data types and hosts function block and control module types in the Object Type Structure. An aspect key object in the Administration Structure describes the existence of the library version.</p> <p>The extension library is an entity extension type. Aspects on the types in the Object Type Structure can be separated into an extension, so that different locations and users can acquire sole control over it.</p>
Control project	Control Project is the host for a set of control applications and controllers.
Control application	Control application is a substructure in the Control Structure and a list in the Object Type Structure hosting the application specific types.
Controller	Controller is the substructure in the Control Structure describing configuration of an AC 800M controller, its communication interface and I/O devices.
Control module type	Control module type is a substructure in Object Type Structure starting with an object of type Control Module Type.
Function block type	Function block type is a substructure in Object Type Structure starting with an object of type Function Block Type.
Diagram type	Diagram type is a substructure in Object Type Structure starting with an object of type Diagram type.
Diagram	Diagram is a substructure as to Control Applications, which is used to group automation solutions.

Table 4. Entity Types and Entity Extension Types (Continued)

Entity Type	Definition
PROFIBUS/HART device topology	Device topology is a substructure in Control Structure starting with the Device Topology object.
FF HSE subnet	HSE Subnet is a substructure in Control Structure starting with an object of type HSE Subnet.

Reservation

If the system supports multiple engineers who can work in the system at the same time, there is a risk of interference when accessing system objects. Therefore reserve the item (entity, single aspect, etc.) to be modified to prevent others from accessing it and accidentally overwriting your work. Reservation guarantees exclusive modify access for a single user to a reserved item. After an item has been reserved, it will stay reserved until it is manually released. Reserving and releasing generates audit events (aspect modified).



Configuration tools such as Control Builder, Fieldbus Builder PROFIBUS/HART, etc. enforce reservation as a mandatory step in the workflow defined by the tool.

Entities, entity-extensions and single aspects (that is, aspects not belonging to an entity or an entity-extension) are items that can be reserved. If an aspect belongs to an entity, the aspect can not be reserved individually. The entire entity must be reserved instead.

Reserving an entity means that all included nested entities and entity extensions are also reserved, unless they are deselected in the reserve window. While an entity is reserved by another user, it is possible to perform certain changes in types used by the entity (such as adding or removing formal instances and aspects). These issues must be considered when work is distributed between users in a multi-user engineering situation.

It is not necessary to reserve an item in order to change it. If it is reserved by someone else and the save operation is attempted, the system will refuse to make the desired changes. Entities and entity extensions can be reserved also if support for

environments is not selected, but single aspects can be reserved only if environment support is selected.

The system may automatically reserve items in certain situations (as a side effect of another reservation for example). Automatic reservations done by the system in this way are also automatically released by the system.

Reserving a library does prevent others from adding new or changing the existing aspects contained in the library. However, it does not prevent changes in libraries that are used by the reserved library.

Aspects and entities that were reserved when a backup was performed will not be reserved when the backup is restored. Previously reserved aspects and entities must be manually reserved again after they are restored.

Also, all objects in a system extension must not be reserved in order to be able to update that system extension.

Working With Environments

A reservation is valid in the environment in which the user is currently working. This means that one user can reserve an item in the Production Environment while another user has reserved the same item in the Engineering Environment. The two users will work on different versions of the same item.

Reservation Procedures

The following four reservation usages are available:

- Reserve an item.
- Take over a reservation.
- Release a reservation.
- Simultaneous reserving and editing.

Reserve An Item

To reserve an item (entity or aspect):

1. Right click the item and select **Reserve**.

2. Use the displayed window to select which items to reserve. Click **Help** for more information on how to use the window.




The same window (with a different name) can also be displayed when an operation that requires reservation of one or more items is tried.

If necessary, refer to [Take Over A Reservation](#) on page 39 for more information about taking over a reservation. When an item is reserved, all the object parts of the item are also reserved. For example, when reserving:

- A controller, all object parts of the controller such as hardware units and tasks are also reserved.
- An application, its programs and data types (but not necessarily its function block types or control module types) are also reserved.



Entity icons in Plant Explorer show only the reservation status (for example ) for the current environment.

Take Over A Reservation

Only one user can reserve an item and no other user can modify it while the item is reserved. However, another user that has Break reservation permission can take over the reservation. This is useful to prevent items from being locked-up indefinitely if the user holding the reservation is not available for some reason. Only members of the Administrators Group have the Break reservation permission by default.

To take over a reservation:

1. Right click the item and select **Manage > View *application_name***.
2. Click the **Take over *application_name*** icon.

Release A Reservation

To release a reservation:

1. Right click the item and select **Release Reservation**.
2. Use the displayed window to select which reservations to release. Click **Help** for more information on how to use the window.



Only reservations in the current environment can be released.

Simultaneous Reserving and Editing

Control Builder supports multiple user engineering in the sense that several users can work in parallel with the same control project.



Strict procedures for preventing concurrent editing of the same object from different engineering workstations must be observed because they prevent confusion and lost changes and not all engineering tools enforce reservations.

Entities and reservation provide support for multi-user engineering. Before modifying the properties of an item, the entity the item belongs to (refer to [Entities and Entity Extensions](#) on page 34 and [Reservation](#) on page 37) should be reserved. This ensures that only one user can modify an item at a time.

Remember that another user can simultaneously reserve the same entity in another environment. This makes it possible to modify the same object in different environments. This is important to remember when deploying the changes from one environment to another. It is therefore recommended to perform an Update (or Replace) before the Deploy operation. Refer to [Deploy](#) on page 28 and [Update](#) on page 31 for more information.



Parts of the Control Builder, Fieldbus Builder PROFIBUS/HART, and Device Type Manager (DTM) will be read-only (some context menu items will be disabled, and editors may be read-only for example) to the current user unless that user has reserved the item.

Security

The 800xA Security model is based on extensions to Windows security model. The extensions make it possible to set permissions for users or user groups on an 800xA System, a structure or part of a structure, or an aspect object. The security setting can also be limited to a single node, or all nodes. This feature makes it possible to require an operation to be performed from a node within sight of the area it controls.

Security and auditing in an 800xA System are set with the Security Definition aspects, which are added to aspects objects.

The security is set by changing the Authority Range, Permissions (related to User Identity/Group/Node and Environment) and Search Option of a Security Definition aspect. By using these settings, the desired security level for a plant is defined. The Audit function is setup more or less in the same way as security. Audit logging will

allow the administrator to track security related events (attempts to access secured objects for example).



Please refer *System 800xA, Administration and Security Instruction (3BSE037410*)* for more detailed information.

When using environments there are two security definitions:

- Security definitions.
- Engineering security definitions.

Security Definitions

Security Definitions contain the normal security definitions and are used in the Production Environment.

Engineering Security Definitions

Engineering Security Definitions contain the security definitions used in all environments except the Production Environment.

The Security Definitions and Engineering Security Definitions work exactly the same and have identical settings possibilities, however the Engineering Environment has slightly different security settings as default.

Practical Application

Having two different types of security definition aspects allows for different security settings in the Production and other environments. It is possible to configure a system to allow an engineer to have extensive permissions in the Engineering Environment but very limited permissions in the Production Environment. These aspects do not need to be added to the same object or even be in the same structure.

To change the default settings for the Engineering Environment, go to **Administration Structure/ Administrative Objects/Domains/System** and change the Engineering Security Definitions aspect.



By default, the Application Engineer group members are granted the permission to Refresh Engineering Environment. If it is desired to have a more restrictive use of this feature, the security settings of the Refresh Engineering Environment permission, needs to be edited. For more information on editing the permissions, refer *System 800xA Maintenance (3BSE046784*)*.

Section 3 Available Functions and Tools

Introduction

This section discusses the functions, tools, and topics:

- [Export and Import.](#)
- [Configure and Deploy.](#)
- [Load Evaluate Go.](#)
- [Information Transferred.](#)

Export and Import

The Import and Export functions are used to transfer information. However, the engineering repository is the recommended method for transferring information. Refer to the *System 800xA, Configuration (3BDS011222*)* for detailed information about the engineering repository.



The Export and Import functions are described in detail in the *System 800xA Engineering, System Maintenance Instruction (3BSE046784*)*.

When the modified applications in the Engineering System are ready, they are copied to the Engineering Environment in the Production System using the Export and then Import functions ([Figure 9](#)). The Export and Import functions allow the copying of applications (import and export data) from and to any 800xA System. The Export function saves data as objects and aspects in archive files (.AFW). The Import function restores the data from the .AFW file to the target system. These functions allow the storing and restoring of objects, aspects and entities. It is also possible to view the contents of a AFW file and compare it with a system.

An engineering solution AFW file retrieved from the engineering repository can be used in place of the exported configuration information from an Engineering System.

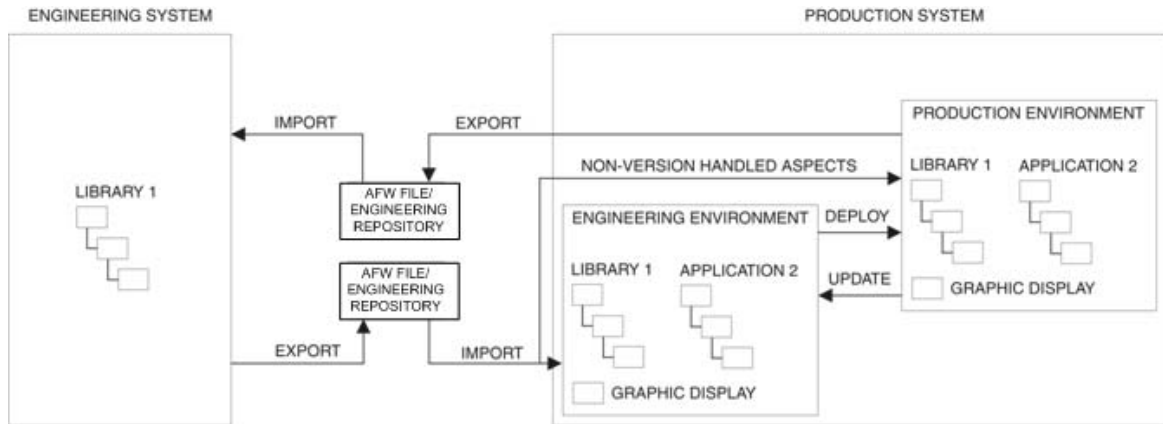


Figure 9. Transferring Information Between Different Systems

Both the Export and Import functions will indicate all aspect dependencies and provide a choice to include or not include them into the target system. If an entity already exists in the target system, Import will replace this entity in its entirety. Before the import takes place the Import function checks the following types of dependencies:

- Dependencies between instances and their types.
- Dependencies to entities.
- Dependencies to system extensions.

The importing of items outside these dependencies is not recommended. The system may start functioning unpredictably, inconsistently, and be difficult to repair. Production-only aspects cannot be imported into the Engineering Environment, they will be skipped by the function, and have to be manually selected and imported into the Production Environment.

The Export and Import functions are powerful instruments for the storage and distribution of entities, objects and aspects. It is possible to save an object and aspect structure and then import it in the same or another part of the structure.

The Export and Import functions should be used to transport small applications in the form of object types and/or object instances between configurations.



Do not export or import very large amounts of aspect objects at the same time. Operational disturbances might then occur because the Export and Import tools load the system significantly. The AFW file limits are specified in the *System 800xA Engineering, System Maintenance Instruction (3BSE046784*)*.



In some configurations upload from an OPC server is used to create objects and aspects. This applies, for example, when using 800xA for Advant Master. If the uploaded objects have been extended with aspects such as graphic displays, it is important to make the import and upload in the correct order. As a general rule the import should be done first and then the upload.

Modifying Items in a Separate System

This topic describes how to export one or more entities, entity extensions and/or single objects and aspects from a Production System to an Engineering System. This ensures that the information in both systems is identical and is a good place to start configuration changes. Changes and isolated environment testing can be done in the Engineering System.



Any of the following tools can be used for data transfer:

- AfwExport
- Engineering Repository
- Application Change Management

When ready, move the changes to the Production System. Production-only aspects must be imported directly into the Production Environment in the Production System. All other items can be imported into the Engineering Environment in the Production System. Once in the Engineering Environment, the changes can be transferred to the Production Environment using the Load Evaluate Go, or Configure and Deploy functions.

Preparations

Make sure that the two systems have the same system extensions (of the same versions). Otherwise, the Import/Export might encounter limitations.

Export to the Engineering System

To export information from the Production System and import it into the Engineering System:

1. Start the Export function in the Production System.
2. Identify the entities, entity extensions and/or single objects and aspects to be exported to the Engineering System.
 - Items can be exported from either the Production Environment or the Engineering Environment.
 - Working procedures may require that entities are reserved first.
3. The Export function lists dependencies that are defined by the selected aspects (for aspects contained in entities the dependencies are listed for the entities). Select the dependencies to be included.
4. The Export function creates an AFW file with the selected entities, entity extensions and/or single objects and aspects. Save the file at a suitable location.
5. Start the Import function in the Engineering System and specify the AFW file created in [Step 4](#).
6. Select the items to be imported. Consider the fact that production-only aspects (indicated by a blue exclamation point icon) cannot be imported into the Engineering Environment of the Engineering System (if applicable). In this case, the Import function will skip all selected production-only aspects.
7. The Import function checks if any item affected by the import is reserved by any other user in the target environment (indicated by a yellow exclamation point icon).
 - If an item is reserved by another user, the function will generate a warning. Proceeding past the warning will cause the entire import operation to fail. Close the Import function and ask that user to release the reservation, or take over the reservation. Proceed to [Step 5](#) to continue.
8. The Import function adds the contents of the AFW file to the Engineering System.
 - Trying to import an item that is dependent on a related library, category, type, or entity that is not present in the target environment is not

recommended. Ignoring the warning and choosing to import anyway will cause the function to skip all aspects whose category is not present in the Production Environment of the Engineering System. The system may start functioning unpredictably, inconsistently, and may be difficult to repair. Close the Import function, fix the problem, and re-import the .AFW file.

9. Run a consistency check when prompted to do so.

Modify

Modify the imported items in the Engineering System. Test the modified items in this system to ensure that they work as intended.

Import to the Production System

To export information from the Engineering System to the Production System:

1. Start the Export function in the Engineering System.
2. Specify the entities, entity extensions and/or single objects and aspects to be exported to the Production System.
 - Working procedures may require that entities are reserved first.



Production-only aspects (indicated by a blue exclamation point icon) in the Engineering System must be imported directly to the Production Environment in the Production System in a separate session. Only version handled aspects can be imported to the Engineering Environment.

3. The Export function lists dependencies that are defined by the selected aspects (for aspects contained in entities, the dependencies are listed for the entities). Select the dependencies to be included.
4. The Export function creates an AFW file with the selected entities, entity extensions and/or single objects and aspects. Save the file at a suitable location.
5. Start the Import function from the Engineering Environment in the Production System and specify the AFW file created in [Step 4](#).



The Import function will skip all production-only aspects.

6. Select the items to be imported. All items (except production-only) can be imported into the Engineering Environment.
7. The Import function checks if any item affected by the import is reserved by any other user in the Engineering Environment (indicated by a yellow exclamation point icon).
 - If an item is reserved by another user, the function will generate a warning. Proceeding past the warning will cause the entire import operation to fail. Close the Import function and ask that user to release the reservation, or take over the reservation. Proceed to [Step 5](#) to continue).
8. The Import function adds the contents of the AFW file to the Engineering Environment in the Production System.
 - Trying to import an item that is dependent on a related library, category, type, or entity that is not present in the target environment is not recommended. Ignoring the warning and choosing to import anyway will cause the function to skip all aspects whose category is not present in the Engineering Environment of the Production System. The system may start functioning unpredictably, inconsistently, and may be difficult to repair. Close the Import function, fix the problem, and re-import the .AFW file.
9. Run a consistency check when prompted to do so.



System extensions and Field Device Libraries must be installed (not imported) into the Production Environment.

Configure and Deploy



The Configure-Deploy support and Load-Evaluate-Go support are the required license features each. Prior enabling Load-Evaluate-Go support, the Configure-Deploy support needs to be enabled.

This topic describes the Configure and Deploy function. Configure and Deploy is a method where engineering is done in two environments (Engineering and Production). [Environments](#) on page 21 describes how to enable environment support. Configure and Deploy allows modifications to be performed in the Engineering Environment without affecting the running process until the

modifications are deployed to the Production Environment for immediate execution.



Configure and Deploy (and Load Evaluate Go) are primarily intended and best suited for incremental changes to already developed and commissioned applications. During the initial phases of a project when changes are many and frequent, it is recommended to work in a single environment.

Use Configure and Deploy when the project enters a phase with formal change control procedures and changes are incremental.



To avoid inconsistent device assignments at IO channels, only work in one environment (Engineering or Production) for the multi environment support engineering work of HART devices.



If the Bulk Data Manager is used to save data to Industrial IT applications in an operating environment, make sure that this does not conflict with secure plant operation.

Device types that must be allocated to a special I/O channel (HART devices for example) must be configured in two steps:

- 1.) Create the device instance using the Bulk Data spreadsheet.
- 2.) Allocate the device to the specific I/O channel using a new row in the Excel spreadsheet.

A typical workflow is as follows (refer to [Figure 10](#)):

1. Create an Engineering Environment as a cloned copy of the Production Environment using the Refresh function.
2. Open the project in the Engineering Environment and modify it as necessary. These modifications do not affect the Production Environment, which contains the project running in the controller. It is still possible to modify aspects in the Production Environment if necessary.
3. Use the Update (or Replace) function to move possible changes in the Production Environment to the Engineering environment.

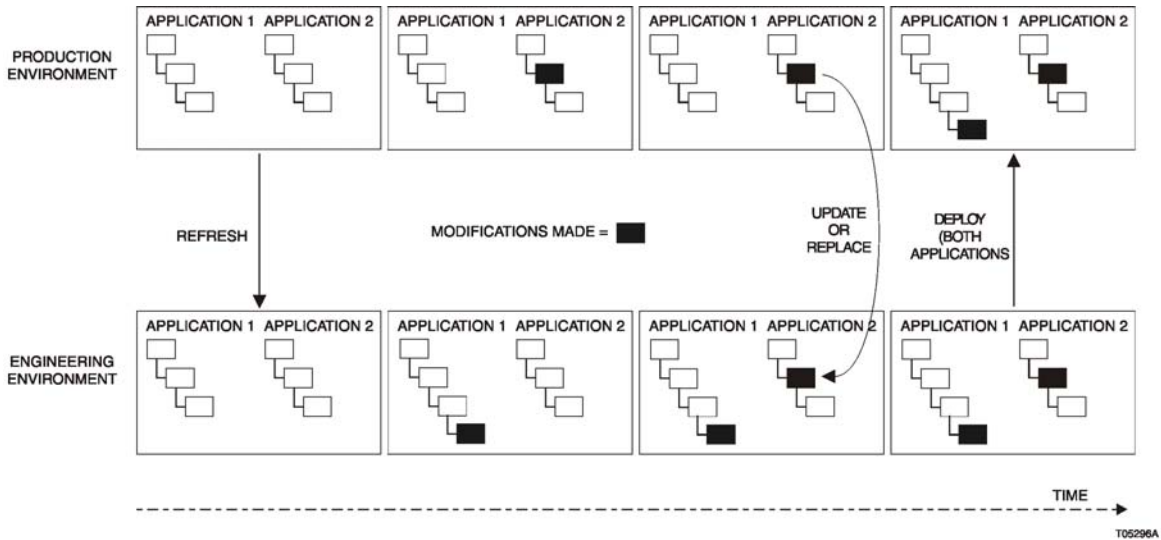


Figure 10. An Example Configure and Deploy Workflow.



Be absolutely certain that the modifications are correct before proceeding.

4. When satisfied with the modifications, deploy the changes to the Production Environment.
5. Re-open the project in the Production Environment and download the modified project to the controller.

Load Evaluate Go



A separate license feature is required to enable the Load Evaluate Go function.

With Load Evaluate Go, download the modified control application to the controller without replacing the running control application. Both application versions will then be executed in the controller in parallel using the same controller input. However, only one application will control the process (control of the process can

be switched between the two application versions). Now compare the two application versions and evaluate the new application version online without interfering with the running application, before either deploying (Go command) or rejecting (Revert command) the change. Administrative permission is required to use Load Evaluate Go sessions.



Do not make any changes in the Production Environment during a Load Evaluate Go session because these changes or the changes in the Evaluation Environment could easily be lost and, under certain conditions, an inconsistent system could result. Operator Notes added during a LEG session might be overwritten. Avoid adding operator notes during the LEG session. Save an additional copy of the operator note text (Notepad or similar application) if the user is forced to write an operator note during the LEG session and verify the operator note when the LEG session has been ended. If required, paste the text from the copy.

Load Evaluate Go can be used to avoid process bumps in systems that are sensitive to such bumps.



It is important that Load Evaluate Go sessions are not left open unnecessarily in order to minimize the impact on system performance.



Load Evaluate Go (and Configure and Deploy) are primarily intended and best suited for incremental changes to already developed and commissioned applications. During the initial phases of a project when changes are many and frequent, it is recommended to work in a single environment. Use Load Evaluate Go when the project is commissioned and enters the maintenance phase.

Environments Utilized

Load Evaluate Go uses four environments (Production, Engineering, Evaluation and Previous). During the Load Evaluate Go session, the old and new application versions are transferred between the different environments as described in the following list and [Figure 11](#).

- The Engineering Environment contains the modified application.
- The Evaluation, Production and Previous Environments are used to hold the new and old application versions during the different steps.
 - The Production Environment will always contain the application version currently controlling the process.

- The Evaluation Environment holds modified application being evaluated. This version can be accepted or rejected.
- The Previous Environment holds the old application in preparation for a quick rollback in cases of unsatisfactory performance.

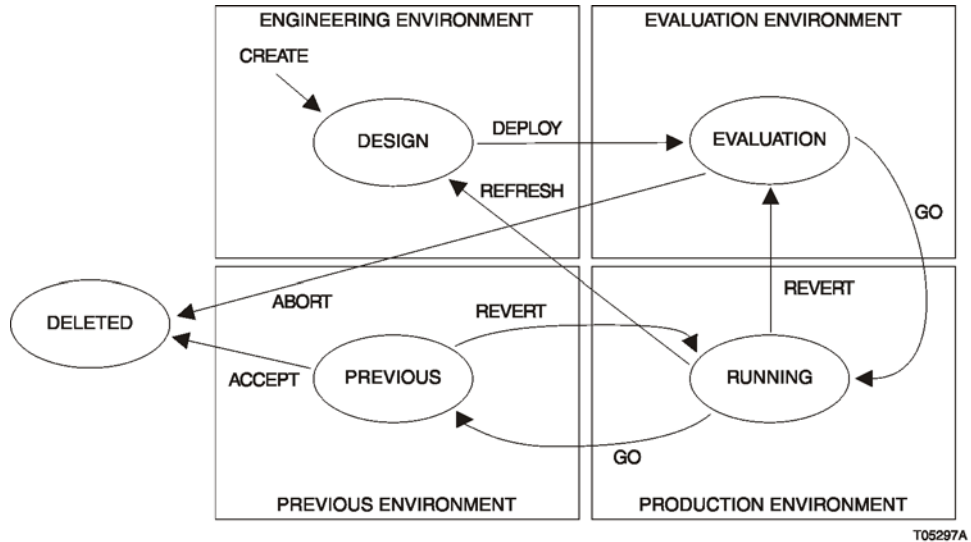


Figure 11. Available Actions Between the Four Environments

Controller States

During a Load Evaluate Go session, the following will take place in the controller:

1. (Load) The modified application is downloaded to the controller. The running application will still control the process (refer to [Figure 12](#)).

When the download is ready, the new application version is warm started (it takes over the values of all retain-marked variables from the running version). The running application version is halted during the warm start and then both versions start executing in parallel.

2. (Evaluate) The two application versions run in parallel, using the same controller input. Use the Evaluation Report to compare their behavior and evaluate detected differences (refer to [Detected Differences](#) on page 54).

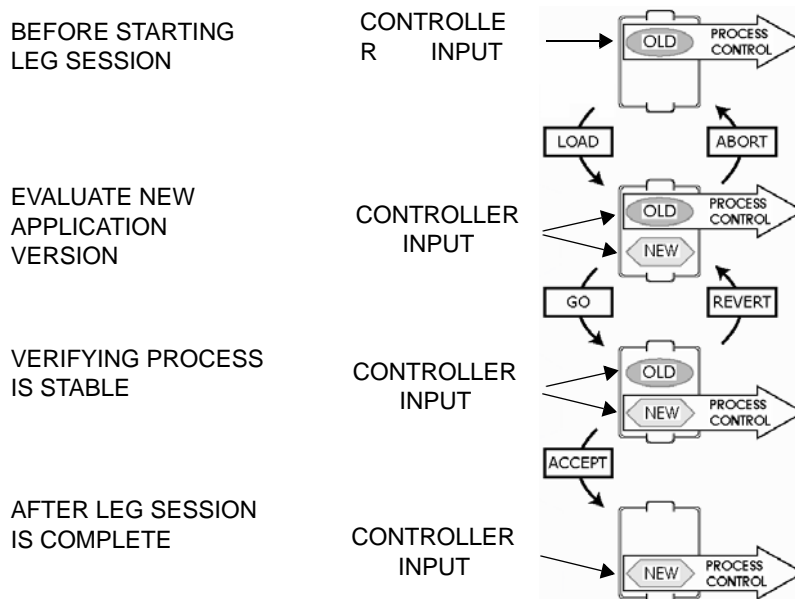


Figure 12. Controller During a Load Evaluate Go

3. (Go) Switch process control from the old application version to the new application version when ready.
4. Verify that the process remains stable and in control.
5. (Accept) Accept the new application version. The old application version will be removed from the controller.

Until the new application version has been accepted, the evaluation can be discontinued using:

1. (Revert) This switches process control back to the old application version.
2. (Abort) This aborts the evaluation and removes the new application version from the controller.

The Go and Revert functions automatically release all Production Environment reservations.

Detected Differences

The differences detected between the Evaluation and Production Environments will be listed in an Evaluation Report. The following can be detected and shown in the Evaluation Report:

- Alarm state and alarm condition differences.
- Access variable differences.
- I/O output channel differences.
- Communication variable output differences

Refer to [Section 5, Load Evaluate Go](#) for more information about the Load Evaluate Go function.

Information Transferred

[Table 5](#) lists the configuration information transferred by each function.

Table 5. Lists the Configuration Information Transferred for Specific Use Cases

Type of Information Transfer Scope	New or Changed Information Use Cases	Export/Import	C&D	LEG	Tune ¹
Application library	Add, modify, and remove variables (local & global)	X	X	X	X
	Add, modify, and remove program code	X	X	X	X
	Add and modify function blocks & graphics	X	X	X	X
	Add and modify control modules & graphics	X	X	X	X
	Add asset monitor application using AC 800M output as an input parameter	X	X		X
	Modify asset monitor application using function block output as an input parameter to AC 800M function blocks, variables, and control modules	X	X	X	X
	Modify operator notes	X ²	X ¹⁰	X	X

Table 5. Lists the Configuration Information Transferred for Specific Use Cases

Type of Information Transfer Scope	New or Changed Information Use Cases	Export/Import	C&D	LEG	Tune ¹
	Add, modify, and remove communication variables	X	X	X	X
	Add and modify diagrams	X	X	X	X
	Add and modify control modules & graphics	X	X	X	X
	Add and modify Diagram Types & graphics	X	X	X	X
Controller	Modify PROFIBUS hardware unit properties ³	X	X	X	X
	Modify hardware unit connections to Hart devices (Modulebus)	X	X		X
	Modify hardware unit connections to Hart devices (Remote I/Os)	X	X		X
	Modify hardware unit connections to PROFIBUS devices	X	X		X
	Add new controller (hardware)	X	X		X
	Enable tool routing under controller settings	X	X		X
	Add and remove hardware unit	X	X		X
	Modify hardware unit settings ³	X	X		X
	Add, remove, & modify hardware unit connections to application ⁴	X	X	X ⁵	X
	Modify I/O channel properties ⁶	X	X	X ⁷	X
	Add, remove, & modify task	X	X		X
	Add, remove, & modify configuration of access variable in controller	X	X	X ⁵	X
Add FOUNDATION Fieldbus HSE subnet					

Table 5. Lists the Configuration Information Transferred for Specific Use Cases

Type of Information Transfer Scope	New or Changed Information Use Cases	Export/Import	C&D	LEG	Tune ¹
Miscellaneous	Add graphics in Functional Structure	X	X	X ⁸	X
	Modify graphics in Functional Structure	X	X	X ⁸	X
	Add Information Management logs	X	X	X ⁸	X
	Add & remove batch configuration, recipes, equipment	X			X
Miscellaneous (continued)	Add & remove Functional Structure trends	X			X
	Add & remove asset monitor on the application & PROFIBUS/HART field devices	X			X
	Modify alarm & event list templates, trend & log templates	X	X		X
	Transfer whole project	X ⁹	X		X
	Add & modify alarm & event configurations	X	X		X
	Add & modify history log templates	X	X		X
	Add & modify trend templates	X	X		X
	Add & modify workplaces	X	X		X

NOTES:

1. Tune refers to making changes to the information in the Production Environment.
2. Import only into the Production Environment.
3. These are the connections found on the property tabs accessed through Control Builder. Refer to [Figure 15](#).
4. These are the connections found on the property tabs accessed through Control Builder. Refer to [Figure 14](#).
5. Refer to [Downloading Changes Affecting Other Applications](#) on page 104 for more information.
6. These are the connections found on the property tabs accessed through Control Builder. Refer to [Figure 13](#).
7. Only the min, max, unit, and fraction information.
8. Only done in the context of a control logic change.
9. The size of AFW files must be kept to a minimum or the Import function may fail. Refer to the 800xA System Administration and Security instruction (3BSE037410*) for the exact limit.
10. The actual operator note does not get overwritten by the deploy operation.

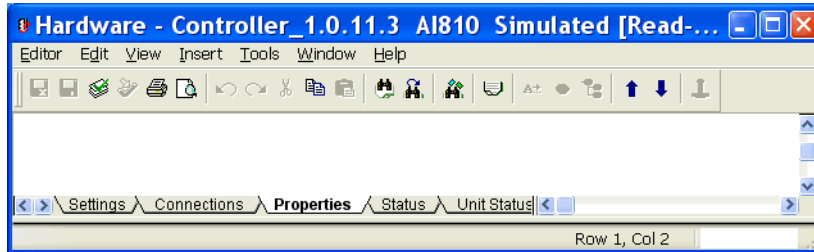


Figure 13. Example Properties Tab

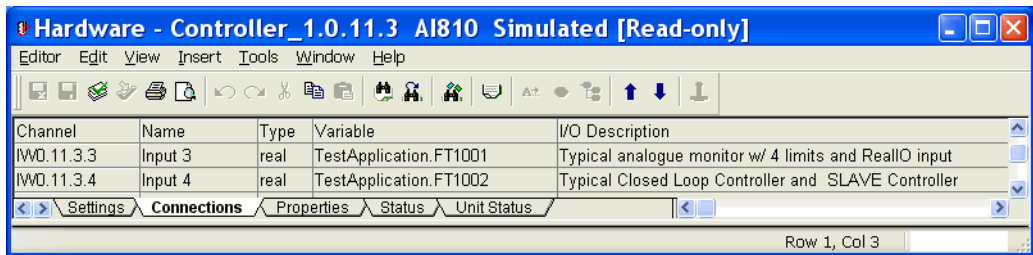


Figure 14. Example Connections Tab

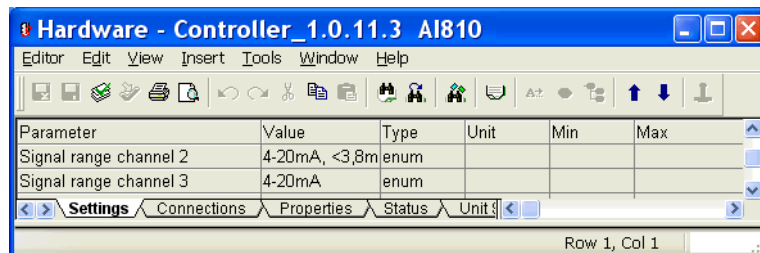


Figure 15. Example Settings Tab

Section 4 Configure and Deploy

Introduction

This section covers the Configure and Deploy method of transferring information from an Engineering System to the Production Environment of the Production System. The procedure consists of:

1. Exporting the configuration information from the Engineering System to an AFW file.



This procedure uses the Import and Export functions to transfer information. For more information on *Export / Import of MMS Generated Function Diagrams from Engineering System to Production System*, refer to Appendix A in *System 800xA Engineering, Function Designer (3BDS011224*)*.

However, the engineering repository can also be used to transfer information. Refer to *System 800xA, Configuration (3BDS011222*)* for detailed information about the engineering repository.

2. Importing the information from the AFW file into the Engineering Environment of the Production System.
3. Deploying the configuration information from the Engineering Environment to the Production Environment for immediate execution.
4. Using the Refresh operation to make the Engineering Environment identical to the Production Environment.
5. Exporting the information from the Engineering Environment of the Production System.
6. Importing the information into the Engineering System.

Exercise caution when using this method because downloading a new application version directly to the controller may cause changes in the process outputs that could disturb the controlled process.

Export and Import

The first step is to export the configuration information from the Engineering System to an AFW file and then import it into the Engineering Environment of the Production System. Refer to [Import to the Production System](#) on page 47 for more detailed information.

An engineering solution AFW file retrieved from the engineering repository can be used in place of the exported configuration information from an Engineering System.

Configure and Deploy

The next step is to deploy the information from the Engineering Environment to the Production Environment using the deploy function. Refer to [Configure and Deploy](#) on page 48 for more detailed information.

Example


The configuration process usually starts with the modified application in the Engineering System. This application could have been modified in the Engineering System or imported from an environment in the Production System. In cases where a separate Engineering System is not used, the modified application in the Engineering Environment may have been modified using the Refresh, Update, or Replace functions (refer to [Propagating Changes](#) on page 27). An example of this method is:

1. Verify the Engineering System is identical to the Production System. If necessary, export the Production System information to the Engineering System.
2. Modify and test the application in the Engineering System.
3. Start the Export function in the Engineering System.

4. Export the modified application to an AFW file.
5. Start the Import function in the Engineering Environment of the Production System.
6. Import the contents of the AFW file.
7. Open the project, with the modified application version, in the Engineering Environment. If necessary, modify the application in the Engineering Environment.
8. Verify that the modified items in the Engineering Environment are correct and that everything should work as planned when moved to the Production Environment.
9. In the Plant Explorer or Control Builder, right click the item or entity to be deployed and select **Deploy**.



The Deploy function will by default automatically include all dependencies (related libraries, categories, types, and entities) that are both defined by the selected items and are either present in both environments but are not identical or are not in the target environment. Do not deselect any automatically included dependency.

10. Check the consistency using the Consistency Checker function. If necessary, manually start the Consistency Checker function using the  icon in the Plant Explorer). Refer to the 800xA System Administration and Security instruction (3BSE037410*) for information on the Consistency Checker function.



Refer to [Modified Library Example](#) on page 64 for information on deploying a modified library.

11. Click **Differences** and select the difference tab in the Deploy function window.
12. Verify that the Deploy function will not destroy any irreplaceable or vital data in the Production Environment. A message stating that the environments are not identical is displayed if the Production or Engineering Environments have been modified. If the differences (changes) are to be kept, use the Update function to copy the changed information to the Engineering Environment

(refer to [Update](#) on page 63), abort the deployment, and proceed to [Step 8](#).



It is recommended that an Update of the relevant aspects be done before the Deploy.

13. Click **Deploy**.
14. The Deploy function checks if any item affected by the deploy is reserved by any other user in the target environment. If an item is reserved, a warning in the deploy summary (for entities) or error message (for aspects) will request the item be released. To release that item, abort the deployment and either request the other user to release the item or take over the reservation.
15. The Deploy function will also display a warning if any item being deployed is dependent on a related library, category, type or entity that is not present in the Production Environment.



Do not accept the warning and allow the Deploy function to continue. Cancel the deployment and fix the problem before continuing.

16. The Deploy function then transfers and replaces the selected items (entities, entity extensions and/or single objects and aspects) from the Engineering Environment to the Production Environment. Entities will be replaced in their entirety (except for those with aspects with a category missing in the Production Environment).
17. Make any necessary additional modifications to the deployed items (in the Production Environment) based on the results of the consistency check that is automatically executed after the Deploy function completes.
18. Use Control Builder to download the control applications to the controller.
19. Release any reserved items.

The Deploy operation is now finished. Process control has been switched from the old application version to the new application version. The old application version is deleted and it is not possible to revert back to the old application version.

Update

To update the Engineering Environment with changes from the Production Environment and then save the Engineering Environment information to the Engineering System:

1. Start the Update function (refer to [Update](#) on page 31).
2. Select the scope for the update (entities, entity extensions, single objects and aspects, or based on filters). The Update function then creates a change report which lists all items modified in the Production Environment since the previous update of the Engineering Environment (within the selected scope). These modified items will be updated in the Engineering Environment.
3. If there are modified items in the Production Environment, decide if the items are to be kept (updated) or proceed with the Engineering Environment as it is. Select the items to be updated back to the Engineering Environment. This selection can be done on the aspect level to avoid the situation that entities that an engineer is working on are replaced in their entirety. There may be certain aspect systems, (Control for example) that may refuse to update an individual aspect that is part of an entity.



To update a single aspect, click the Launch Update Tool button in the Plant Explorer and drag and drop the aspect of interest into the blank Update window.

4. Click the Update button and the Update tool replaces all items in the Engineering Environment with the selected items from the Production Environment.
5. Start the Export function in the Engineering Environment of the Production System.
6. Export the Engineering Environment information to an AFW file.
7. Start the Import function in the Engineering System.
8. Import the contents of the AFW file.

Alternatively, you could export directly from the Production Environment if it is not necessary to update the Engineering Environment.

Modified Library Example

This example describes a situation where a modified library is to be used in several applications while the current library is being used by other applications. Create a new major library version (not a minor version that would replace the current version) for the modified library in order to avoid having library modifications immediately affect all applications that use the library. The new and the old library versions will exist in parallel. Applications should be modified to use the new library version in the Engineering System (or Engineering Environment of Production System) before using Configure and Deploy to load them. The recommended procedure is:



Utilize this same procedure for using a delivered library.



It is not necessary to create a new major library version if it is desired to have library modifications immediately affect all applications that use the library.

1. Make a new library version and modify the library in the Engineering System (or Engineering Environment of the Production System).
2. Modify the affected applications to use the new library version.
3. If necessary, use the Export and Import functions to transfer the modified library version and applications to the Engineering Environment in the Production System.
4. Deploy the new library version and all modified applications from the Engineering Environment to the Production Environment.
5. Download the library version and all modified applications.

Section 5 Load Evaluate Go

Introduction

This section covers the Load Evaluate Go method of transferring information from an Engineering System to the Production Environment of the Production System. The procedure consists of:

1. Exporting the configuration information from the Engineering System to an AFW file.



This procedure uses the Import and Export functions to transfer information. However, the engineering repository can also be used to transfer information. Refer to *System 800xA, Configuration (3BDS011222*)* for detailed information about the engineering repository.

2. Importing the information from the AFW file into the Engineering Environment of the Production System.
3. Starting a Load Evaluate Go session in the Engineering Environment.
4. Loading the information into the controller, evaluating, verifying, and then accepting the modified information for use.

This method is ideally suited to processes that are sensitive to bumps in process outputs because it provides additional capabilities to detect and avoid such bumps. However, this method can be used in all types of processes.



Only one controller application can be evaluated ([Step 3](#)) at a time for the entire 800xA system. There cannot be concurrent Load Evaluate Go sessions in different controllers.

Export and Import

The first step is to export the configuration information from the Engineering System to an AFW file and then import it into the Engineering Environment of the Production System. Refer to [Import to the Production System](#) on page 47 for more detailed information.

An engineering solution AFW file retrieved from the engineering repository can be used in place of the exported configuration information from an Engineering System.

Load Evaluate Go

The next step is to deploy, evaluate, test, and accept the modified control application for use. Modified process graphics, libraries, etc. can be evaluated at the same time as the control application. The following is a basic workflow for this step:

- **Start a Load Evaluate Go Session** - Start a Load Evaluate Go session in the Engineering Environment of the Production System using Control Builder.
- **Deploy Application** - Deploy the modified control application from the Engineering Environment to the Evaluation Environment using Control Builder.
- **Download Application (Load)** - Download the modified application from the Evaluation Environment to the Controller where it is executed in parallel to the current approved application. An Evaluation Report is displayed.



It is suggested to use the Task Analysis tool to minimize reports on task latency.

- **Evaluate the Application (Evaluate)** - Use the Evaluation Report to compare the existing and modified applications.
- **Abort the Evaluation** - Abort the evaluation of the modified application if it is unsatisfactory or needs more modifications.
- **Switch Process Control (Go)** - Switching control of the process from the existing application to the modified application.
- **Verify Application** - Verify that the modified application is performing as desired.

- **Revert Process Control** - Switch process control from the modified application back to the existing application if the modified application is not performing as desired.
- **Accept Application** - Accept the modified application as the approved application if it is performing correctly and no more modifications are required.

Figure 16 also shows the basic workflow.



LEG is a managed feature that require TSA process.

Controller Functions During Evaluation

The following functionality applies to controllers during evaluation:

- [Application Start and Execution](#).
- [Forcing of I/O](#).
- [Peer to Peer Communication](#).

Application Start and Execution

The Evaluation phase in the controller is started with the download from the Control Builder in the Evaluate Environment. When the download is ready, the existing application is halted, while the new, modified application version performs a warm start.

- The application's tasks are halted.
- The new application version takes over the values from the existing version's retain-marked variables. Other variables are initialized.
- The new application version executes its Start code.
- The application's tasks are restarted. The new application version is executing as Passive version, and the existing application version is executing as Active version.
 - In the first scan, the new, Passive application version will execute any FirstScan or initialization code, as configured in the application or libraries.

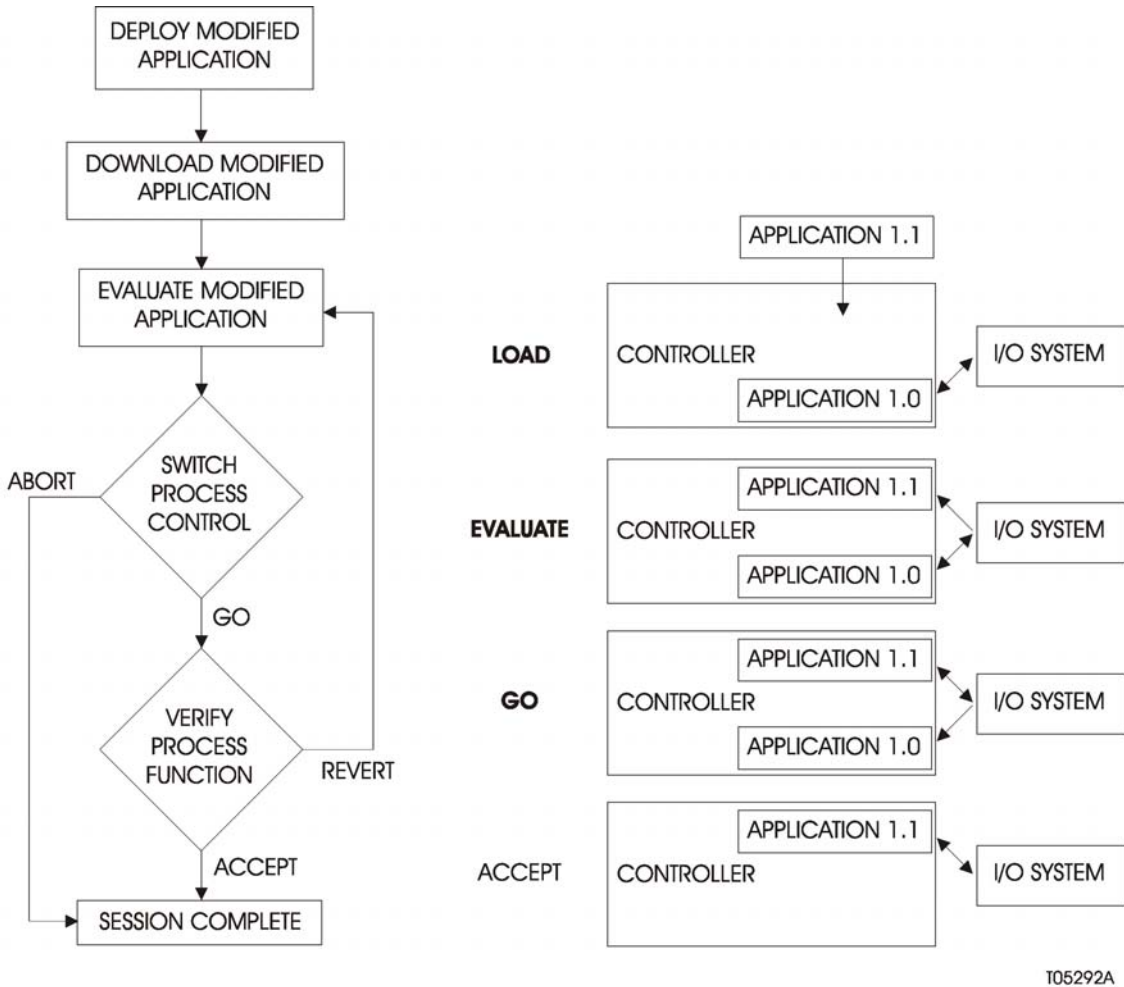


Figure 16. LEG Basic Workflow

- The existing application will not be subject to any kind of initialization. It will continue with exactly the same state as before the warm start.

Consequently, instances of standard library function blocks like flip-flops, counters and timers will be synchronized at the start of Evaluation, until differences between

the applications versions make them drift apart. Time and timer functions are kept synchronized between the two application versions because they are executed by the same tasks.

SFC states are also copied. However, care must be taken when SFC diagrams are modified as part of a Load Evaluate Go session. There is a risk that the token (step activation) may disappear or be multiplied at significant changes to SFC layout.



The random number generators in SystemLib are not synched between application versions. They produce different results at each call.



The task property functions SetInterval and SetPriority are disabled during Load Evaluate Go, in both Active and Passive application version. It is generally recommended not to use these functions in process control applications.

Forcing of I/O

Only the Active application version drives process outputs, whereas input values are propagated to both application versions. Forcing of I/O channels is controlled from the Active application version.

Forcing of I/O is implemented using the structured I/O data types BoolIO, RealIO, etc., with the components Forced and Value. These components are treated like any other retain-marked variables in a Load Evaluate Go session.

- At start of Evaluation, the Passive application version copies all Forced and Value from the existing application.
- If a channel is forced, unforced, or value is changed from an operator faceplate in the Production Environment, the change will affect both application versions
- If a channel is forced, unforced, or value is changed from an operator faceplate in the Evaluation Environment before Go, or in the Previous Environment after Go, only the passive version will be affected. Refer to [Process Operation](#) on page 79 for more information.
- If a channel is forced, unforced, or value is changed from the Control Builder, only the application version that is connected to the Control Builder is affected. Refer to [Tuning in Control Builder](#) on page 81 for more information.
- The Go and Revert operations thus may lead to changes in Forced state. However, the Evaluation Report will warn about differences on output values.

Peer to Peer Communication

All peer-to-peer communication is treated similarly during Evaluation, regardless of communication protocol (MMS, MODBUS, and others). The list below describes the behavior in the controller where an Evaluation is running.

- On the client side, Read operations are issued by both application versions. There is no implicit synchronization of transmission and responses. This may lead to differences between the two application versions, both in timing and in received values. Also, of course, there is some increase in communication load on the affected controllers.
- Write operations are handled very differently. The Active application version issues Write transactions as usual. In the Passive version, the Write operations are concluded immediately without any message being sent. This may lead to different timing between application versions.
- On the server side, a Read request (for an Access Variable, for example) will fetch and return its result from the Active application version.
- A Write request will write to both application versions.

Special issues to consider are:

- Added or removed Access Variables will be detected and indicated in the Evaluation Report.
- Changing type declaration of a communicated, structured variable, will give a Read/Write error as long as the client and server don't have identical types. This is not unique to LEG, but difficult to avoid.
- Especially for serial link protocols, the duplication or Read messages may affect response times.
- Added or removed communication variables with direction out will be detected and indicated in the Evaluation Report.

End a Load Evaluate Go Session

The correct way to end a Load Evaluate Go session is to use the Abort or Accept commands in the Evaluation report. If the Abort command is used will the passive application in the Controller be deleted, the Evaluate and Previous environments will also be deleted and the Control Builder will automatically switch environment from Evaluate to Production.

The **End LEG Session** menu option in the **Tools** menu shall be avoided and in most cases only be used if the Controller isn't running in Evaluation mode (Evaluation mode = A download from Evaluation is done, but the Abort or Accept command hasn't been used, i.e. one active and one passive version of an Application is running in the Controller).

When the **End LEG Session** menu option is used will the Evaluate and Previous environments be deleted and the Control Builder will change environment to Production. The controller will not be affected when End LEG Session is used (the active and passive application will still be running in the Controller).

Proper situation to use End LEG Session:

- Before Deploy.
- After Deploy, but before Download from Evaluation.
- To clean up after a disruption, when the LEG Session can't be resumed and conducted from the Evaluation Report.

Examples

The following examples describe common scenarios for Load Evaluate Go:

- [Basic Example](#) on page 72.
- [Modified Library Example](#) on page 76.
- [Modified Hardware Example](#) on page 77.
- [Connect Variable Example](#) on page 79.

Basic Example

This example describes the exporting, importing downloading, evaluating and accepting of a new application version:



Evaluate the increased controller load before downloading the application. Refer to [Controller Load](#) on page 83.



If it is determined during a Load Evaluate Go session that code or configuration changes must be made, abort the session, make the necessary changes in the Engineering Environment and restart the session.

1. Ensure that no reports or archiving operations are executing on the Engineering and Production Systems.
2. Ensure that no scheduled jobs are being performed.
3. Disable the Scheduler service found in the Service Structure.
4. Disable the Calculation service found in the Service Structure.
5. Start the Export function in the Engineering System.
6. Export the modified application to an AFW file.
7. Start the Import function in the Engineering Environment of the Production System.
8. Import the contents of the AFW file.
9. Open the project with the modified application version in the Engineering Environment using Control Builder. If necessary, modify the application in the Engineering Environment.
10. Verify that the modified items in the Engineering Environment are correct and that everything should work as planned.
11. Start a new Load Evaluate Go session (**Tools > Start LEG Session**) from within Control Builder. Two new environments (Evaluation and Previous) will be created. At this time, their content will be identical to the Production Environment.



To view the current application version, open the same project in the Production Environment on another workstation. It is possible to use the Control Builder online editors (in the two workstations) to:

- Further investigate any differences found by comparing variable definitions (for example).
- Compare internal states and verify any modified program logic by comparing sequential functional charts (SFCs) for example.

It is also possible to use Engineering Workplaces (one in each workstation) to verify any modified process graphics. If the process graphics have not been modified properly, there may be OPC errors for references to removed items.

12. Add the items to be deployed from the Engineering Environment to the Evaluation Environment (that is, the modified application and possibly any modified controller or library) in the displayed Deploy window.



Refer to [Modified Library Example](#) on page 76 for information on deploying a modified library.



Modified process graphics not part of any entity can also be deployed by adding them in the Deploy window.

13. Deploy the items from the Engineering Environment to the Evaluation Environment.



If prompted to do an Update and it is needed, abort the Load Evaluate Go session, resolve the problem, and restart the session.

14. Reopen the project in the Evaluation Environment from the same workstation.
15. Verify the modified application (and possibly any modified controller or library) are present.
16. Download the modified application to the controller.
 - a. Download the application.
 - b. Verify that Evaluation is selected in the Online Analysis window ([Figure 17](#)) and click **Continue**. Only the modified application should be listed.
 - c. Evaluate the information in the Difference Report window. When ready, continue the download process.

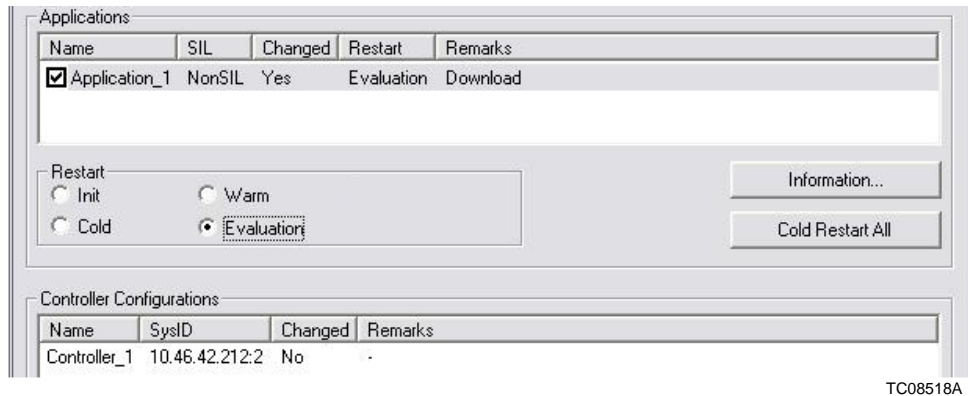


Figure 17. Online Analysis Window

When the download is ready, the running application version is temporarily halted. The new modified application version is warm started (it takes over the values of all retain-marked variables from the existing version and its start code is executed). The normal task execution is resumed driving both application versions in synchronized execution.

17. The Evaluation Report window is displayed when the download is complete. The different tabs in the Evaluation Report window (Figure 18) list variables whose values differ between the old and the new application version. Click **Help** for more information about the report and how it is to configured.
18. Evaluate the differences listed on the All tab. To simplify the tab, move acceptable differences to the Group tab by right clicking the difference and selecting **Move to Group Tab**. The selected variable will be removed from all other tabs and moved to the Group tab.

While evaluating the differences, remember that modifying program logic or calculations can cause values to differ between the two application versions. Otherwise, they should be the same.

19. If the differences are acceptable, proceed to [Step 21](#). If the differences are not acceptable Proceed to [Step 20](#).
20. Click **Abort** to exit the Load Evaluate Go session leaving the controller in its original state.

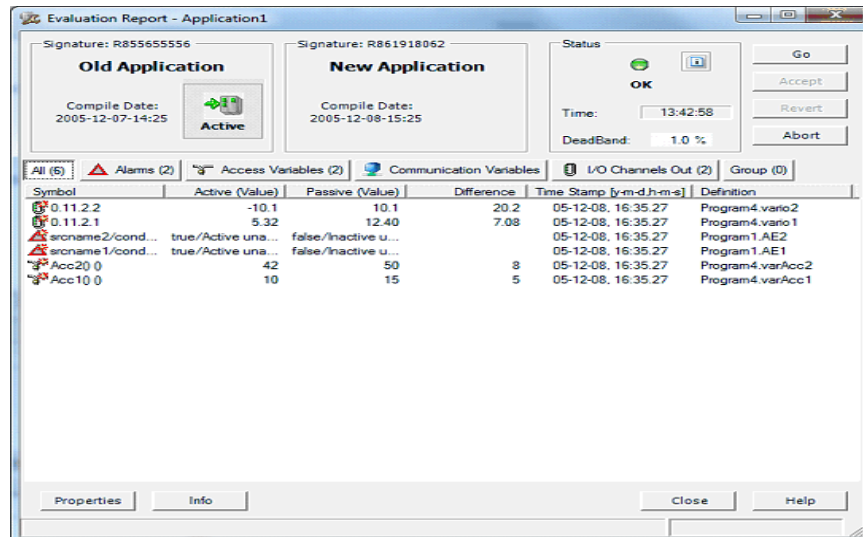


Figure 18. Evaluation Report

- Click **Go** in the Evaluation Report. The Update window displays any changes that have occurred in the Production Environment since the start of the Load Evaluate Go session.



Controller output differences (I/O values) should be minimal before continuing. Otherwise, there will be process bumps when process control is switched.

- Update the listed items from the Production Environment to the Evaluation Environment. This may take some time, but is necessary to avoid overwriting any changed content in the Production Environment. After the update, the Evaluation Environment will be identical to the Production Environment which contains the changes deployed from the Engineering Environment.
- Click **Go** when asked to confirm the Go operation is still desired. Process control is switched from the existing application version to the modified application version. Also:
 - The entire Production Environment will be copied to the Previous Environment.

- The content of the Production Environment will be replaced by the entire content of the Evaluation Environment.



- There is still an increased controller load because both applications are running. Controller workload will return to normal only after the modified application is accepted or the Load Evaluate Go session is terminated (Abort).
24. Verify that the process remains stable when the modified application version controls the process, and that everything is as expected. If necessary, click **Revert** to switch process control from the modified application back to the old application and then **Abort** to exit the Load Evaluate Go session leaving the controller in its original state.
 25. Click **Accept** in the Evaluation Report window to accept the modified application as the current application. The old application version is removed from the controller and the Load Evaluate Go session is closed. Both the Evaluation and Previous Environments are removed. Control Builder will automatically reopen the project in the Engineering Environment.
 26. Enable the Scheduler service when the Load Evaluate Go session is complete.
 27. Enable the Calculation service when the Load Evaluate Go session is complete.
 28. Refresh the Engineering Environment in the Production System.
 29. Start the Export function in the Engineering Environment of the Production System.
 30. Export the Engineering Environment information to an AFW file.
 31. Start the Import function in the Engineering System.
 32. Import the contents of the AFW file.

Modified Library Example

This example describes a situation where the modified library is used in several applications. Create a new major library version (not a minor version that would replace the current version) for the modified library in order to avoid having library modifications immediately affect all applications that use the library. The new and the old library versions will exist in parallel. Applications should be modified to use the new library version in the Engineering System (or Engineering Environment of

Production System) before using Load Evaluate Go to load, test, and accept them. The recommended procedure is:



The procedure for using a delivered library is the same.



It is not necessary to create a new major library version if the library is only used by one application and it is desired that library modifications immediately take affect.

1. Make a new library version and modify the library in the Engineering System (or Engineering Environment of the Production System).
2. Modify the affected applications to use the new library version.
3. If necessary, use the Export and Import function to transfer the modified library version and applications to the Engineering Environment in the Production System.
4. Start a new Load Evaluate Go session.
5. Deploy the new library version and first modified application from the Engineering Environment to the Evaluation Environment.
6. Download, evaluate, test, and accept the library version and first modified application by following [Step 14](#) through [Step 25](#) of the [Basic Example](#) on page 72.
7. Repeat [Step 5](#) through [Step 6](#) for each of the remaining modified applications.

After many Load Evaluate Go sessions, many library versions may have been created with only the most recent version being used. All the library versions remain in the 800xA system which may eventually cause the system size to increase to the point that performance is negatively affected. Manually delete all unused library versions to avoid this situation.



Use the Library in Use function within Control Builder to verify that a library version is not used by other applications or libraries.

Modified Hardware Example

This example describes a situation where hardware modifications (adding, removing, or changing an I/O unit for example) are made. These hardware modifications and the accompanying application modifications should be made in

the Engineering System (or Engineering Environment of the Production System) before being loaded, tested, and accepted.



A change in hardware (I/O connection for example) always requires a change in the application (dummy change if necessary) in order to make a download from the Evaluation Environment.

Load Evaluate Go will not download hardware modifications but they can be imported and deployed to the Production Environment. Refer to [Information Transferred](#) on page 54 for more information about the types of information transferred by this function. Load Evaluate Go will download the modified applications to be loaded, tested, and accepted one at a time. The recommended procedure is:

1. Make the desired hardware and application modifications in the Engineering System (or Engineering Environment of the Production System).
2. If necessary, use the Export and Import function to transfer the modified hardware and applications to the Engineering Environment in the Production System.
3. Deploy the modified controller from the Engineering Environment to the Production Environment.
4. Download the modified controller from the Production Environment to the actual controller.
5. Start a new Load Evaluate Go session.
6. Deploy the first modified application from the Engineering Environment to the Evaluation Environment.



The Deploy function will by default automatically include all dependencies (related libraries, categories, types and entities) that are both defined by the selected items and are either present in both environments but are not identical or are not in the target environment. Do not deselect any automatically included dependency.



Use caution when deploying libraries. All applications that use the deployed library will start using the library immediately. Also remember that a library may be included as a dependency to another deployed application.

7. Download, evaluate, test, and accept the first modified application by following [Step 14](#) through [Step 25](#) of the basic example.
8. Repeat [Step 6](#) through [Step 7](#) for each of the remaining modified applications.

Connect Variable Example

This example describes a situation where a variable needs to be connected to an I/O channel. The I/O unit must first be added to the Hardware structure within Control Builder and downloaded from the Production Environment.

1. Open the project in the Engineering Environment and make the modifications of the application.
2. Connect the variables to the I/O channels from the Engineering Environment.
3. Start a Load Evaluate Go session and deploy both the application and controller to the Evaluation Environment.
4. Download from the Evaluation Environment and evaluate information. Complete the Load Evaluate Go session if the behavior is acceptable.
5. In the Production Environment, enable the I/O channel in the hardware editor of the I/O unit, change the value of the Inverted property (if required), and download the changes.

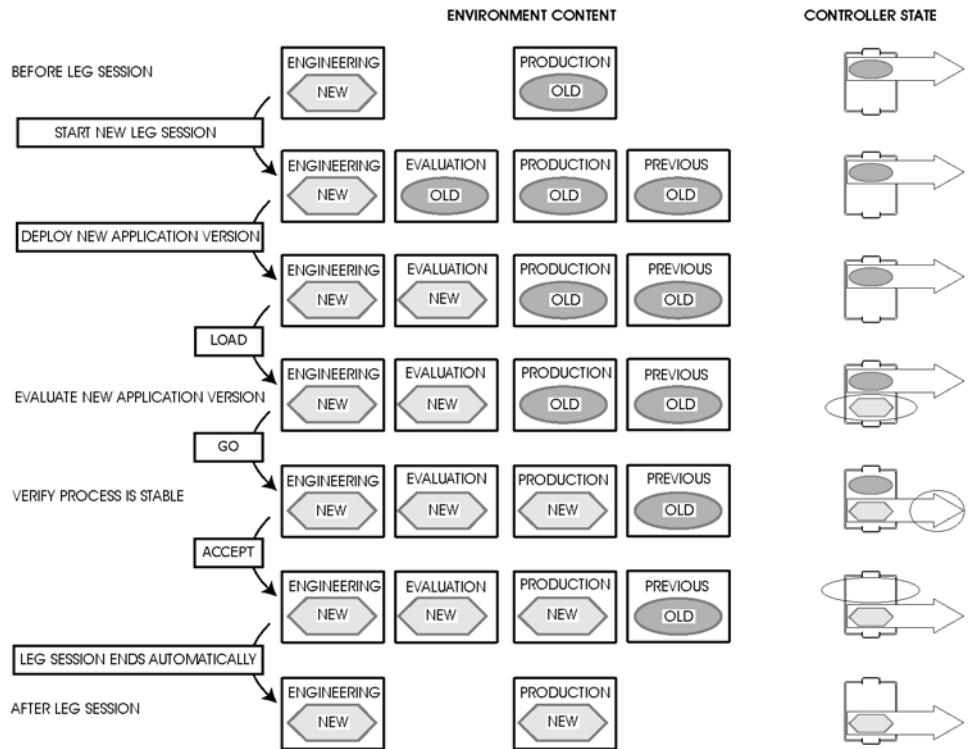
Environment Content Details

[Figure 19](#) shows environment content during a Load Evaluate Go session in which the changes are accepted. [Figure 20](#) shows environment content when you discontinue an evaluation. (Controller state changes are circled).

Process Operation

All environments can read values from the Production Environment. This means that process graphics and faceplates in all environments can display live process data.

With the exception of AC 800M controllers in Load Evaluate Go sessions, values can only be written to controllers and devices from the Production Environment.



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Figure 19. Environment Content During Successful Load Evaluate Go

Normal process operation is normally only possible from the Production Environment.

During a Load Evaluate Go session, it is possible to write values (from graphics, faceplates, etc.):

- From the Production Environment to the active **and** passive (being evaluated) application versions in the controller. These values will affect both application versions.
- From the Evaluation Environment to the passive application version in the controller (**before** the Go function is used) or to both the active **and** passive

application versions in the controller (**after** the Go function is used but before the Revert function is used).

- From the Previous Environment (normally not recommended) to the active **and** passive application version in the controller (**before** the Go function is used) or to only the passive application versions in the controller (**after** the Go function is used but before the Revert function is used).

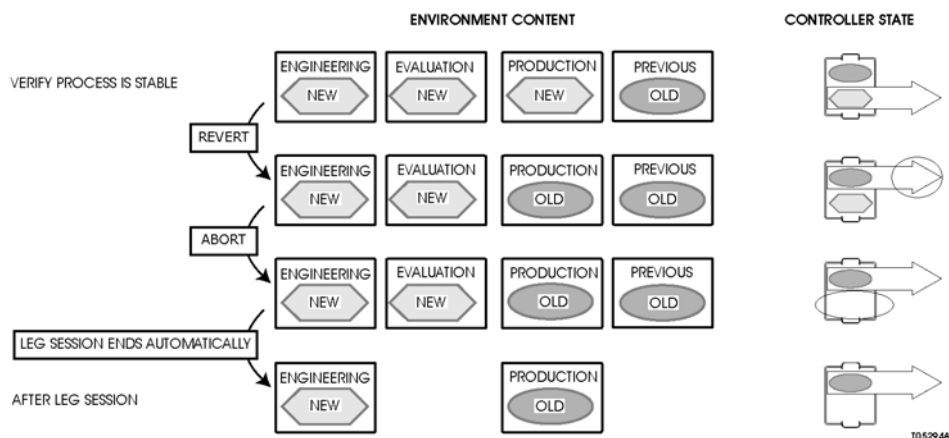


Figure 20. Environment Content When Evaluation is Discontinued

Tuning in Control Builder

Tuning changes made using the Control Builder online editor affect the application version that is current in the environment you are working in when online mode is activated (for the entire Load Evaluate Go session). For example:

- Tuning changes made in the Evaluation Environment are made to the application version that was last downloaded from the Evaluation Environment to the Production Environment.
- Tuning changes made in the Production Environment are made to the application version that was active (controlling the process) in the Production Environment when Online mode was activated. This means that if Online mode is activated **before** the Go function is used (or **after** the Revert function

is used), tuning changes are made to old application version. If Online mode is activated **after** the Go function is used (but **before** the Revert function is used), tuning changes are made to the new application version.

The Control Builder online editor writes to only one application version.

Unexpected Load Evaluate Go Termination

The following topics describe how to recover from an unexpected termination of a Load Evaluate Go session. [Resume Session](#) describes situations where the session can be restarted. [Cleanup](#) described a situation where the session no longer exists.

Resume Session

There are two scenarios where a Load Evaluate Go session can be resumed:

1. The Evaluation environment still exists, Control Builder has been closed for some reason (reboot of computer, network problems, Control Builder Shutdown), but the Controller is still running in Evaluation mode.

Solution:

- a. Open the project in the Evaluation Environment.
 - b. Attach (go online but do not download) Control Builder to the controller.
 - c. Open the evaluation report from the Tools menu and continue the session.
2. The Evaluation environment does not exist, the End LEG Session function has been performed, but the Controller is still running in Evaluation mode.

Solution:

- a. Start a new Load Evaluate Go session.
- b. Deploy the changes and go online from the Evaluation Environment.
- c. Open the evaluation report from the Tools menu and continue the session.



This solution is only possible if no changes have been made since the Load Evaluate Go session was aborted.

Cleanup

If it is not possible to resume the LEG session and the Controller is running in evaluation mode (there is one active and one passive application running in the Controller) it is possible to remove the passive application from the Production Environment using the following steps:

1. Verify that no Load Evaluate Go sessions are running.
2. Click **Abort** or **Accept** in the Evaluation Report window.
3. Go into Offline mode from Control Builder.
4. Right click the controller and select **Remote System > Show Downloaded Items**.
5. Select the passive application and click **Remove Selected Application**.

Load Evaluate Go Restrictions

- Load Evaluate Go download to HI controllers is by default blocked in Control Builder to prevent running into an overload situation that may lead to a shutdown.
- Distributed applications (applications connected to several tasks, executing in different controllers) can not be evaluated in a Load Evaluate Go session. Control Builder will issue an error message and prevent download in Evaluation mode.
- Control Builder and AC 800M controller must be of the same system version.
- The SerialCommLib standard library does not support Load Evaluate Go. If an application uses any objects from the SerialCommLib library, do not use Load Evaluate Go.

Controller Load

Since two application versions will run at the same time in the controller, performance will be affected. Further, the execution of other applications with lower priority may be impacted during a LEG session. Before downloading the modified application version to the controller, consider the increased controller load. Decide

if it is possible to proceed with the download or not before proceeding. Control Builder will not prevent the controller from being overloaded.

- Check CPU load.
- Estimate if there is enough spare capacity to also run the new application version. Unless changes that significantly change execution times have been made, the load caused by the new application version should be about the same as that of the current application version.
- Use the Task Analysis Tool to analyze and predict the task execution in the controller. The tool shows a graphical representation of how the tasks are scheduled and helps the user to avoid overload and latency situations caused by bad task tuning. For more details on Task Analysis Tool, refer to *Industrial^{IT} 800xA - Control and I/O, Basic Control Software, Introduction and Configuration*, (3BSE035980*).
- Calculate the load of the new application version by calculating the sum of load of the tasks executing the application. The load per task is equal to execution time/interval time.
- Decide if it is advisable to proceed with the download or not. Control Builder will not prevent the controller from being overloaded.

Ensure that the Controller contains enough unused memory to store and execute both the current and modified applications simultaneously before starting a Load Evaluate Go session. The controller should have enough memory to handle all the active applications plus that of the largest application.

Controller Setting Changes That Prevent LEG

Downloading to the controller from the Evaluation Environment is only possible if the controller hardware configuration has not been changed. Some examples of controller hardware configuration changes that prevent downloading are:

- Changes to CPU related hardware settings.
- Adding or deleting hardware modules (I/O and communication devices for example).
- Changes to I/O channel settings including Enable Channel and Invert BoolIO.
- Changes to task configuration.

The following settings **can** be changed without preventing downloading:

- Changes to analog signal properties Min, Max, Unit, and Fraction.
- Connecting and disconnecting variables to and from I/O channels.

Section 6 Configure and Refresh

Introduction

This section covers the Configure and Refresh method of transferring information from an Engineering System to the Production Environment of the Production System. Transferring graphic display and controller changes to the Production Environment are examples of actual uses of this method. The procedure consists of:

1. Exporting the configuration information from the Engineering System to an AFW file.



This procedure uses the Import and Export functions to transfer information. However, the engineering repository can also be used to transfer information. Refer to the *System 800xA, Configuration (3BDS011222*)* for detailed information about the engineering repository.

2. Importing the information from the AFW file into the Production Environment of the Production System for immediate execution.
3. Using the Refresh function to make the Engineering Environment identical to the Production Environment.
4. Exporting the information from the Engineering Environment of the Production System.
5. Importing the information into the Engineering System.

Exercise caution when using this method because downloading a new application version directly to the controller may cause changes in the process outputs that could disturb the controlled process.

Export and Import

The first step is to export the configuration information from the Engineering System to an AFW file and then import it into the Production Environment of the Production System. Refer to [Import to the Production System](#) on page 47 for more detailed information.

Refresh

The next step is to copy all configuration information from the Production Environment to the Engineering Environment using the refresh function. This results in both environments being identical. Refer to [Refresh](#) on page 34 for more detailed information.

Example

The configuration process usually starts with the modified application in the Engineering System. This application could have been modified in the Engineering System or imported from an environment in the Production System. An example of this method is:

1. Start the Import and Export function in the Engineering System.
2. Export the modified application to an AFW file.
3. Start the Import and Export function in the Production Environment of the Production System.
4. Import the contents of the AFW file.
5. Make any necessary additional modifications to the imported items (in the Production Environment).
6. Use the Refresh function to make the Engineering Environment identical to the Production Environment.
7. Use Control Builder to download the control applications to the controller.
8. Release any reserved items. The imported application is now controlling the process.

9. Start the Import and Export function in the Engineering Environment of the Production System.
10. Export the Engineering Environment information to an AFW file.
11. Start the Import and Export function in the Engineering System.
12. Import the contents of the AFW file.

Section 7 Special Considerations

Introduction

This section discusses the special conditions and situations that may occur while engineering in environments.

Viewing Different Environments

Use two separate workstations (not one workstation with two monitors) to view two different environments at the same time using Plant Explorer because users can quickly become confused as to which environment they are currently in. Only one instance of Control Builder can be started on a workstation so only one environment can be viewed at a time using Control Builder.

System Engineering

Perform system configuration and maintenance activities in the Production Environment only. Do not perform any system engineering activities while a Load Evaluate Go session is open or changes are being made in the Engineering Environment. Refresh the Production Environment to the Engineering Environment when these activities are complete. Examples of System configuration and maintenance activities are:

- Adding or updating basic software.
- Adding or updating system extensions.
- Installing field device libraries.
- Adding or removing users, servers, workplaces, etc.

Graphics

Graphic displays changed in the Engineering System (or Engineering Environment) must be compiled before they are deployed to the Production or Evaluation Environments.

Graphic elements changed in the Engineering System (or Engineering Environment) must be deployed to the Production or Evaluation Environments using the following procedure:

1. Use the Display Tool to locate all graphic displays that use the changed graphic elements.
2. Use the Deploy function in the Display Tool (and Graphics Builder) to recompile all graphic displays that use the changed graphic elements.
3. Use the Deploy function from the Plant Explorer (or Engineering) workplace to deploy the changed graphic elements to the target environment. Existing graphic displays that use these changed elements will continue to use the previous elements until the recompiled graphic displays are deployed.
4. Deploy the recompiled graphic displays (only a few at a time) to the target environment.

Alarms and Events

Alarms and events are presented in all environments but are only generated in the Production Environment. Audit events are generated in all environments. During a Load Evaluate Go session, only the application version actively controlling the process generates alarms and events.

The passive application version contains its own set of Alarm objects whose states evolve with the input values (the AlarmCondition objects). As a result, the alarm states in the active application version may be different that those in the passive application version. This difference is presented in the Evaluation Report. After using the Go or Revert function, the set of active alarms in the operator's alarm list may change.

An operator acknowledge of an alarm is passed on to both the passive and active application versions. However, since only the alarm states of the active application version are reflected in the operator alarm list, only its active or inactive

unacknowledged alarms can be easily acknowledged. That is, if an alarm has gone active in the passive application version only, it will be indicated in the Evaluation Report but not in the Alarm list. At the next usage of the Go or Revert functions, there will suddenly be an unacknowledged alarm in the Alarm list.

To avoid this, the alarm in the passive application version can be acknowledged through the AlarmCondition object's Interaction Window in Control Builder. This window is accessed from the context menu in the Evaluation Report.

Batch Management Control

For control of batch processes to function correctly, the Go and Revert operations (part of the Load Evaluate Go session) must be performed under very carefully controlled conditions. Otherwise, the state of the passive application will be uncertain and making it active may cause unpredictable results.

AC 800M unit and phase configuration can be done in the Engineering Environment and transferred to the Production Environment directly or through a Load Evaluate Go session. Recipe procedure configuration can only be done in the Production Environment.

When Go or Revert are used during a Load Evaluate Go session, all batch units and phases in the evaluated application (both the passive and active version) must be in the idle state. If any unit or phase is no idle, Go and Revert will be prevented. This is indicated in the Evaluation Report which also shows the unit or phase that is not idle. It is possible to release any acquired equipment and stop active phases from the corresponding faceplates or the Batch Manager.

Batch recipe and equipment definitions can only be imported into the Production Environment while related batch control applications can be imported into the Engineering Environment. To ensure that references between the two are not broken:

1. Export the batch procedures, equipment definitions, and related batch control applications from the source environment. The easiest way is to export the entire Procedure and Equipment Structures.
2. Import the batch recipes and equipment definitions into the Production Environment of the target system.

3. Refresh the Engineering Environment in the target system.
4. Import the related batch control applications into the Engineering Environment of the target system.
5. Perform any required modifications to the related batch control applications.
6. Transfer the batch control applications to the Production Environment either directly or one-by-one through Load Evaluate Go sessions.

PROFIBUS and HART

PROFIBUS and HART devices with Device Type Manager (DTM) can be used for offline configuration only. Online execution using Fieldbus Builder PROFIBUS/HART (upload and download) and configuration of the OPC Server PROFIBUS/HART can be done in the Production Environment only. The entire controller needs to be reserved before performing configuration and parameter changes using DTM. Use the Update/Refresh function in the system to ensure the Production and Engineering Environments are identical.

Device parameter must not be changed during a Load Evaluate Go session.

Configuration changes to field devices such as changes in DPV0 parameters to PROFIBUS devices (through Control Builder or DTMs) can be done in the Engineering Environment but must be deployed directly to the Production Environment. These changes cannot be evaluated using the Load Evaluate Go function.

Environment Support for Device Library Wizard

The Device Library Wizard supports an installation or extension of the separately delivered device types in 800xA Production Environments only. After installation the device type objects are available in 800xA Plant Explorer Object Type Structure of the Production Environment and must be synchronized to the Engineering Environment manually.

The engineering of field devices is supported in both 800xA environments, whereas offline engineering is supported in the Engineering Environment and online changes can be performed in the Production Environment only.

Environment Support for Fieldbus Builder PH

This topic details environment support for Fieldbus Builder PROFIBUS/HART for distributed engineering with entities and reservation in 800xA systems.

Aspects in the Different Environments

Without environment support enabled, the 800xA system can be described as Production Environment but with engineering environment capabilities. This means, that online and offline functionality is available within one system environment. Multi-user access and synchronized databases are realized using the 800xA reservation function.

With environment support enabled, a new Engineering Environment is created in parallel to the 800xA system. From the system startup screen, one of the environments has to be chosen manually.

The following aspects support versioning for both environments:

- FBB OPC Data Source Definition (AC800xA common Aspect Category).
- Control Connection (AC800xA common Aspect Category).
- Device Management.
- Fieldbus Management.
- Property Management.
- Module Management.
- Device Definition.
- IPValueHolder.
- FBB FileSync Helper.

The following aspect do not support versioning:

- FBB OPC Configuration.
- Module Definition.

Entities and Reservation

An entity can be reserved and released. Reserve means that aspects within the entity are locked both from reservation and from check-out by other users. Release makes the entity available to other users for change. When an aspect object is reserved, it is implicitly checked-out and checked-in after releasing the entity.

- Every device type object is available as a member of one entity only.

- To manage devices in HART Multiplexer Network, a new FBB Entity aspect category is or shall be created.
- An OPC Configuration aspect must be part of an entity.
- Device type objects placed below AC 800M controllers are managed by the AC 800M defined entities.

Use Case for Engineering Support

This topic describes use cases relating to reservation, communication mode to DTMs, and deploy operation while working in environments.



Fieldbus Builder P/H has various permissions like **FDT-Observer**, **FDT-Operate** in order to work correctly with DTM user roles. These permissions must be mapped into Engineering Environment using “Engineering Security Definition” Aspect. Otherwise it is not be possible to work with Device types with DTM support. Refer the [Figure 21](#).

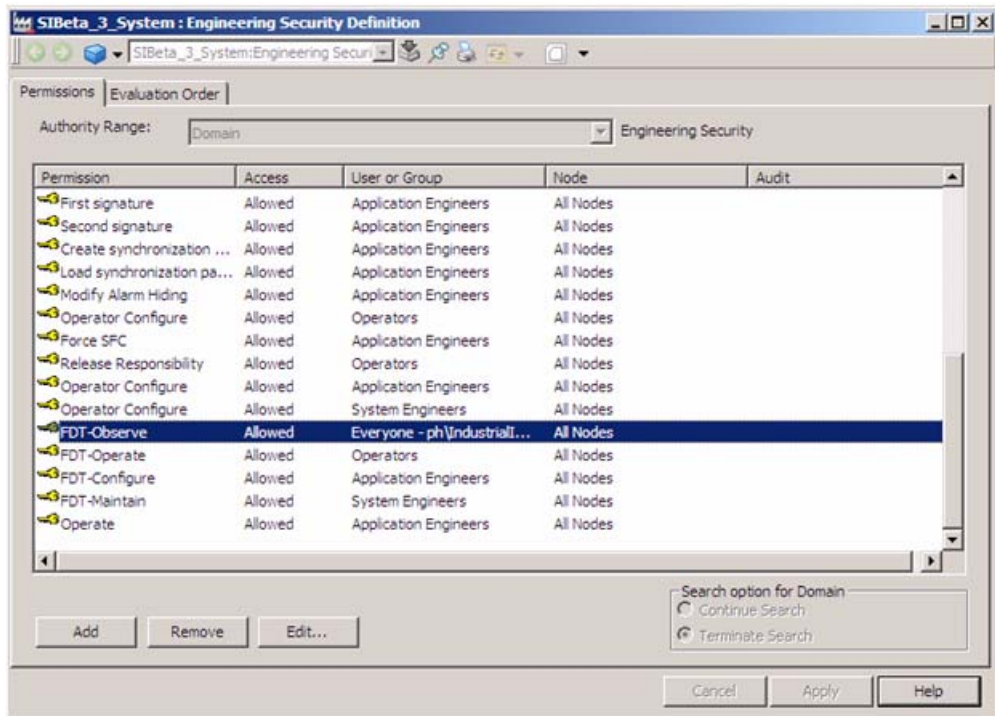


Figure 21. Engineering Security Definition

Reservation and Communication Mode

Production Environment. The following items should be performed or observed:

- The user opens fieldbus management aspect and selects **enable communication** item in context menu.
- Communication mode is going to be enabled.
- All open in offline communication mode device management aspects views will be closed.
- If no entity reservation is done, the following context menu items will be disabled:

- Upload.
- Download.
- Import.
- Otherwise all context menu items are enabled.

Engineering Environment. The following items should be performed or observed:

The **enable communication** item in context menu is going to be disabled.



Communication mode is only possible in Production Environment.

Reservation While Branch is Online (Communication Mode Enabled)



This is only possible in Production Environment.

Preconditions. The topology subtree is online. The corresponding entity is not reserved: no writing online operations are running.

Reservation. The user reserves the entity.

- Subtree remains in online mode.
- Items (Upload, Download, Import) will be enabled in context menu.
- No communication mode changes for another users.

Release Reservation while Branch is Online and Working



This is only possible in Production Environment.

Preconditions. The topology subtree is in online communication mode. The corresponding entity is reserved by the user. Online operation (upload for example) is running.

Release Reservation. The user releases reservation.

- Open fieldbus management dialogs will be set offline.

- All open device management aspect views in Production Environment will be closed. If some DTM data hasn't been changed (for example, parameter in device management aspect have been changed but not applied), the user will be prompted if the data should be saved or not.
- Running online operations will be aborted with corresponding error messages.

Deploy While Branch is Online and Working



This is only possible in Production Environment.

Preconditions. The topology subtree is in online communication mode. The corresponding entity is reserved by the user. Online operation (upload for example) is running.

Deploy. The user accomplishes some changes in Engineering Environment and performs deploy.

- All open device management aspect views in the Production Environment will be closed. If some DTM data hasn't been changed (parameters in the device management aspect have been changed but not applied for example), the user will be prompted if the data should be saved or not.
- Communication mode will be disabled for all users in Production Environment.
- Running online operation will be aborted.
- Data and topology of entity in production environment will be changed, according to entity state in the engineering environment.



Close the Production Environment (to close all opened DTMs) before starting a deploy operation.

OPC Server Configuration

Deploy from Engineering to Production. Some changes are made on the DTM data and topology and the changes are deployed to the Production Environment.

- Control connections in the Production Environment will be emptied.
- Due to the changes of topology, the user updates the OPC server configuration.
- The user configures the OPC Server in Production Environment.
- The control connections will be filled in the Production Environment.
- The user performs upload to the Engineering Environment.

Asset Optimization

The following Asset Optimization operations can be performed on the instance or object type in the Engineering Environment, and then deployed to the Production Environment.

- Configuration of Asset Monitors (including enable/disable).
- Configuration of Asset Monitoring Service Data Source Definitions.
- Configuration of Control Connections.
- Creation of Asset Reporter.
- Creation of Asset Viewer.
- Configuration of Maximo Equipment ID.
- Configuration of SAP Equipment ID.
- Creation of Fault Report Submitter.
- Creation of Fieldbus Devices. HART Devices will also be created in DMS.
- Configuration of DMS Parameter Mappings.

The following Asset Optimization operations can only be performed in the Production Environment:

- Starting the AO Server.
- Full load of the AO Server.
- Incremental load of Asset Monitors.
- Configuration of Maximo Credentials.
- Configuration of SAP Credentials.
- Fault Report submission.
- DMS Division synchronization.
- DMS Device synchronization.
- Device calibration.

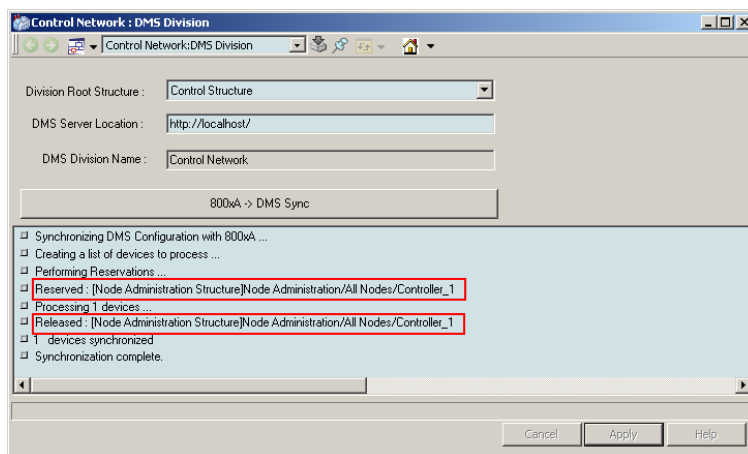
DMS Synchronization

The DMS and Division aspects can be created inside any entity. The best known usage of them inside entities are HART Devices like TH02 with the corresponding DMS Calibration aspect.

In this case the **800xA** → **DMS Sync** synchronization operation will have to reserve all the parent entities for devices being synchronized. After the operation completes, all the reserved entities will be released. [Figure 22](#) shows an example.



If some entities are already reserved the operation will abort. The engineer will be requested to manually release all the required entities and restart the operation.



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Figure 22. DMS Synchronization

AO Server Load

1. When initiating a load operation of Asset Monitors belonging to an entity, such as an AC 800M Controller, the load procedure will attempt to reserve those entities before the configuration is loaded to the AO Server. After the load operation completes, all reserved entities will be released. [Figure 23](#) provides an example.



If an entity reservation fails, as a result of an existing reservation by a different user, then the load operation is aborted. If this happens, perform [Step 2](#) and [Step 3](#).

```

14:25:05 Stopping Asset Monitoring Service...
14:25:07 [AD Server 1] Start Full Load...
14:25:08 Performing Reservations ...
14:25:08 Reserved : [Control Structure]Foot/Net1
14:25:08 Reserved : [Node Administration Structure]Node Administration/All Nodes/Controller_1
14:25:08 [AD Server 1] Loading configuration to node: MARINKAE. AMs: 16 Conditions: 51
14:25:09 [AD Server 1] Load Success.
14:25:09 Updating AMs ActiveConfiguration...
14:25:12 Configuring AM Service Data Sources...
14:25:12 Asset Monitoring Service Data Sources are up to date.
14:25:12 Full AMs load operation successful.
14:25:13 Released : [Control Structure]Foot/Net1
14:25:13 Released : [Node Administration Structure]Node Administration/All Nodes/Controller_1
14:25:13 Starting Asset Monitoring Service.
  
```

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Figure 23. Entity Reserve and Release Process Example

2. Request that the entities reserved by the other user (or users) be released.
3. Perform an incremental load of just the unreserved entities, or the entities already reserved by the user performing the load. To do so:
 - a. Sort all Asset Monitors by the *Object Path* in the AO Server aspect.
 - b. Select the group of Asset Monitors that belong to the same controller.
 - c. Select **Load/Unload** from the context menu.



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

Devices With DMS Aspects

Use the following information for Asset Monitors and other devices containing DMS aspects:

Configure and Deploy method:

- Asset Monitors deleted from the Engineering Environment are automatically unloaded from the engine when the changes are deployed to the Production Environment.
- Devices containing DMS aspects that are deleted from the Engineering Environment are automatically deleted from Meriam DMS when the changes are deployed to the Production Environment.

Load Evaluate Go method:

- Asset Monitors deleted from the Engineering Environment are not automatically unloaded from the engine when the Go function is used. Manually remove these Asset Monitors from the engine using the AOServer Load/Unload Config context menu as a follow-up step to the Load Evaluate Go session.
- Devices containing DMS aspects that are deleted from the Engineering Environment are not automatically deleted from Meriam DMS when the Go function is used. Manually remove these devices as a follow-up step to the Load Evaluate Go session.

SMS and e-mail Messaging

The following SMS and e-mail Messaging operations can be performed on the instance or object type in the Engineering Environment, and then deployed to the Production Environment.

- Configuration of Message Handler.
- Configuration Alarm and Event Message Source.

The following SMS and e-mail Messaging operations can only be performed in the Production Environment:

- Configuration of Devices (Modem Device, E-mail Device, SMS Device).
- Configuration of Message Schedule.

Multi System Integration

LEG is supported in Provider systems but not in Subscriber systems. During a LEG session, Multi System Integration upload is not supported.

Production-only Aspects



Entities or entity extensions that contain production-only marked aspects cannot be deployed. These entities or entity extensions cannot be used in the Configure and Deploy or Load Evaluate Go methods.

If the system contains production-only aspects, these aspects are read-only in the Engineering Environment. Entities including these aspects can only be created or deleted in the Production Environment. It may even be impossible to change production-only aspects of such entities in the Engineering Environment because other, production-only aspects that use the change hook may refuse to change since they are read-only.

Downloading Changes Affecting Other Applications

There are limitations to the downloading of applications with certain hardware changes during Load Evaluate Go sessions. Control Builder will not allow the downloading of application changes that affect the I/O or access variable connections to applications other than the one being evaluated. Make and evaluate the changes one application at a time. A message stating `Application cannot be evaluated due to changes made to the controller configuration. Only changes to I/O connections and Variable Access belonging to the application that is about to be evaluated are allowed. The selection will be reverted. will displayed if any attempted I/O connection changes to the application affect other applications.`

Calculation Aspects

The Calculation aspect (an Information Management aspect) can be changed in the Engineering Environment and deployed to the Production Environment directly or through the Load Evaluate Go function. The Production Environment Calculation aspect will be updated but the executing version of the calculation script will not. Use the following procedure to force the calculation engine software to read, compile, and start the new calculation script version:

1. Deploy the modified Calculation aspect to the Production Environment.

2. Disable the Calculation aspect in the Production Environment.
3. Enable the Calculation aspect.

The write access permission of the Calculation aspect set in the Previous Environment will be in affect for both versions of the aspect before the Go function is used. After the Go function is used (but before the Revert function is used), the write access permission of the Calculation aspect set in the Previous Environment will only affect the passive version of the aspect.

Backup and Restore

Backing up a Production System will not save the contents of the Engineering Environment. Use the Export function to save the contents of the Engineering Environment. Modifications can be made in the Engineering Environment while backing up a Production System but all Load Evaluate Go sessions must be closed.

Only the Production Environment is restored when a Production System is restored. All other environments are removed. Do not restore a Production System while a Load Evaluate Go session is active or modifications are being made in the Engineering Environment.

Digital Signatures

Digital signatures are only valid in the environment in which they were made. If as aspect that was signed in the Engineering Environment was deployed to the Production Environment, it must be resigned in the Production Environment for the signature to be valid in the Production Environment.

Log Over

Log-over is only supported in the Production Environment.

Process Object Locking

The process object locking feature is not compatible with engineering in environments. Disable this feature in systems where support for environments is enabled.

Section 8 Environments Support

The information in this section provides a general description of the 800xA supported environments and its feature. The standard workflow for Device Type Objects in different environments and their configuration is described in section *System 800xA, Configuration (3BDS011222*)*.

Details of entities and reservation are described in [Entities and Entity Extensions](#) and [Reservation](#).

Overview

This section describes details for Device Management PROFIBUS & HART, if Environment support within 800xA system is used.

800xA System in version 5.0 onwards supports the concept of environments (Production Environment and Engineering Environment), whereas the different environments may contain different versions of one or more aspects. This means, that an aspect may exist in several versions at the same point of time in the same system.

Entities and Reservation (Distributed Engineering)

Starting from ABB 800xA version 5.0 onwards the system provides an enhanced multi-user support. Optionally the system can be extended for environment support allows to have different system configuration in certain environments. So called *entities* are available as base functionality at object types in the 800xA System to enable multi-user engineering. The entity allows to lock (reservation) a project, controller or applications to prevent simultaneous configuration of aspects and objects in the 800xA system. Reservation functionality is available with right mouse click at the device type object in 800xA Plant Explorers Control Structure.

The following kind of objects available in the Control Structure can be used to make a reservation for underlying objects and aspects:

- Projects, applications, controllers
- Libraries, libraries with hardware types
- Control modules types, except hidden control module types
- Function block types, except hidden function block types
- HART Multiplexer Networks (via FBBEntityCategory Aspect)

Environments

In 800xA systems with enable environment support the following options are available:



Environment support is separately licensed and available in the ABB 800xA price book. Note that environment support is irreversible - the only way to remove this function is to delete the system and create a new one.

The *Production Environment* defines the functions that are used to control and supervise the process.

A separate *Engineering Environment* allows engineering changes to be done and deployed in a controlled way to the Production Environment. The Engineering Environment allows to change configurations in the same system as the production system without affecting the on-going production in the Production Environment.



The IO channel assignment supports only one environment for engineering work of HART devices. *Production Environment* is preferred.



In the *Engineering Environment*, the DTM configuration data will not be automatically stored in the Aspect Directory, even if the DTM is closed.

To save all instance data of the DTM to the aspect directory, the project has to be released once before starting the deploy function. Project release functions will store all device instance data into the aspect directory.

Configure and Deploy

The *Configure and Deploy* functionality is used to synchronize changes done in the Engineering Environment with the Production Environment. When the deploy dialog is opened, the user first selects the Production Environment. As second step the entity, entity extension, and/or the single object has to be selected to start environment synchronization via deploy function.



To avoid inconsistent device assignments at IO channels, choose only one environment (engineering or production environment) for engineering work of HART devices in terms of multi environment support.



To save all instance data of the DTM to the aspect directory, the project has to be released once before starting the deploy function. Project release functions will store all device instance data into the aspect directory.

Distributed Engineering via Import/Export

This section describes the standard workflow for Distributed Engineering without using the Environment support within 800xA SV5.0. To distribute a project from a system to another different system the 800xA standard export and import function can be used. It is mandatory to have the same system environment with the installed and loaded system extensions be available in the different created systems.

Distributed Engineering can be performed only, if the project, which shall be distributed to another system environment for engineering, is locked to prevent simultaneous engineering work. A project or a part of a project can be reserved by using the 800xA systems reservation function.



The workflow described in this sections focus on PROFIBUS and HART device type objects only. Distributed engineering for controller applications, libraries and function block is described in the specific user instruction of the Systems functional area.

HART and PROFIBUS device type objects, including aspects for Device Type Manager (DTM), Asset Monitors, DMS (HART), Maximo, SAP etc. requires a reservation for any configuration changes. Two possibilities for a reservation is provided by the system:

- **Manual Reservation/Release by the user**
The user has to open a system context menu and to select the reservation function manually. The entity is locked by the user till he will release it. Other user can not work with this entity during the lock time.
- **Automatic Reservation/Release by the system**
The system reserves an entity automatically, which shall be changed in its configuration. This can be done only, if no other user is working in parallel on this entity. After finishing the configuration the entity will be released automatically by the system.

For distributed engineering the first reservation function is required, means, the user has to reserve the project to be exported manually to prevent parallel work at the same project.

If the project is locked (reserved), it can be exported by using the 800xA Import/Export tool. If the export file shall be imported in the system environment without changing the installed system and system extensions (e.g. as backup), for HART and PROFIBUS device type objects a special workflow is not required.

If the exported project shall be imported in a different system environment on a different system node, a special workflow must be considered:

- Both systems shall be installed in the same manner.
- All system components and used system extensions have been loaded, so that there are no differences between the both system environments.

Environment support for Device Library Wizard

The Device Library Wizard supports an installation or extension of the separately delivered device types in 800xA Production Environments only. After installation the Device Type Objects are available in 800xA Plant Explorers Object Type Structure of the Production Environment and must be synchronized to the Engineering Environment manually by the user.

Engineering of field devices are supported in both 800xA environments, whereas offline engineering is supported in the Engineering Environment and online changes can be performed in the Production Environment only.



In case of enabled 800xA Environment support, the Device Library Wizard installs the device types in the Production Environment only. Synchronization between Production Environment and Engineering Environment must be performed via the 800xA System manually by the user. Refer to 800xA System documentation to get more details about Environment support.

Environment Support for Fieldbus Builder PH

This section describes details of environment support for Fieldbus Builder PROFIBUS/HART for distributed engineering with entities and reservation in the 800xA systems.

Aspects in the different Environments

Without environment support the 800xA system can be described as *Production Environment* but with engineering environment capabilities. This means, that the user has online and offline functionality available within one system environment. Multi-user access and synchronized databases are realized by using 800xA reservation function.

With environment support a new *Engineering Environment* is created in parallel to the 800xA system. From the system start-up screen one of the environments has to be chosen manually by the user.

Following aspects support versioning for both environments:

- FBB OPC Data Source Definition (AC800xA common Aspect Category)
- Control Connection (AC800xA common Aspect Category)
- Device Management
- Fieldbus Management
- Property Management
- Module Management
- Device Definition
- IPValueHolder

- FBB FileSync Helper

Following aspect do not support versioning:

- FBB OPC Configuration
- Module Definition

Aspect without support of versioning can only exist in one version. Those aspects can not be created, changed, or deleted in the Engineering Environment, but all changes must be done in the Production Environment.

Entities and Reservation

An entity can be reserved and released. Reserve means that aspects within the entity will be locked both for reservation and for check-out from other users. Release makes the entity available to other users for change. When an aspect object is reserved, it is implicitly checked-out and checked-in after releasing the entity.

- Every Device Type Object is available as a member of one entity only.
- To manage devices in HART Multiplexer Network, a new FBB Entity aspect category is or shall be created.
- An OPC Configuration aspect has to be part of an entity.
- Device Type Objects placed below AC 800M Controller are managed by the AC 800M defined entities.

For a detailed description about Reserve, Taking Over a Reservation and Release a Reservation, refer [Take Over A Reservation](#) and [Release A Reservation](#).

Use Cases for Engineering Support

This section describes use cases in relation with reservation, communication mode to DTM's and deploy operation during working in environments.

Reservation and Communication Mode

Production Environment

- The user opens fieldbus management aspect and selects **enable communication** item in context menu.
- Communication mode is going to be *enabled*.
- All open in offline communication mode device management aspects views will be closed.
- If no entity reservation is done, the following context menu items will be disabled:
 - Upload
 - Download
 - Import
- Otherwise all context menu items are *enabled*.

Engineering Environment

- The *enable communication* item in context menu is going to be disabled.
- Communication mode is only possible in production environment.



Reservation while Branch is Online (Enable Communication mode)



This is only possible in Production Environment.

Preconditions

The topology subtree is online. The corresponding entity is not reserved: no writing online operations are running.

Reservation

The User reserves the entity

- Subtree remains in online mode
- Items (Upload, Download, Import) will be enabled in context menu
- No communication mode changes for another users

Release Reservation while Branch is Online and Working



This is only possible in Production Environment.

Preconditions

The topology subtree is in online communication mode. The corresponding entity is reserved by the user. Online operation (e.g. upload) is running.

Release Reservation

The user releases reservation.

- Open fieldbus management dialogs will be set offline.
- All open device management aspect views in Production Environment will be closed. If some DTM data hasn't been changed (e.g parameter in device management aspect have been changed but not applied), the user will be prompted if the data should be saved or not.
- Running online operations will be aborted with corresponding error messages.

Deploy while Branch is Online and Working



This is only possible in *Production Environment*.

Preconditions

The topology subtree is online. The corresponding entity is reserved by the user in Production Environment. Online operation (e.g. upload) is running.

Deploy

The user accomplishes some changes in Engineering Environment and performs deploy.

- All open device management aspect views in Production Environment will be closed. If some DTM data hasn't been changed (e.g parameter in device management aspect have been changed but not applied), the user will be prompted if the data should be saved or not.
- Communication mode will be *disabled* for all users in Production Environment.
- Running online operation will be *aborted*.
- Data and topology of entity in production environment will be changed, according to entity state in the engineering environment.



Before starting a deploy, close the *Production Environment* to close all opened DTMs.

OPC Server Configuration

Engineering Environment



There is no possibility to configure the OPC Server PROFIBUS/HART in the Engineering Environment.

- The view of the FBB-OPC Configuration Aspect is *disabled*.
- The *Configure OPC Server* menu item in the Fieldbus Management aspect is *disabled*.
- The Control Connection aspects are empty.

Deploy from Engineering to Production

The user performs some changes on DTM data and topology and deploys changes to Production Environment.

- Control connections in Production Environment will be emptied.
- Due to the changes of topology the user have to update OPC server configuration.
- The user configures OPC Server in Production Environment.
- The control connections will be filled in Production Environment.
- The user performs upload to the Engineering Environment.

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