



## DeltaV Online Upgrades



This document describes how a DeltaV user may extend the system to add more automation to an existing facility or how one may upgrade an entire DeltaV system to a new system revision level without interrupting the process.

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## Introduction

Many Emerson Process Management customers have processes that execute continuously for years. The economics of their operations are such that the customer cannot afford to shut down the facility to upgrade the control system.

At the same time we encourage our customers to keep their systems current. Technology is moving more rapidly than ever before. With this new technology comes enhanced features and, in many cases, low prices. Most are feeling the pressure to do more with fewer staff. With the convergence of automation and IT solutions, this goal is achievable—provided that the automation solution is one that deploys commercial off-the-shelf technology and follows the key technology trends.

Process automation systems need to be kept current due to these economic forces. If the process may not be shut down, then the only choice left is to upgrade the automation system online.

With a DeltaV system, online upgrades are expected and provided for: a small automation addition or a whole upgrade of the existing system.

## DeltaV Online Expansions and Additions

A number of DeltaV revisions have been made available since its introduction in 1995. Each revision has brought new functionality: redundant I/O, redundant controllers, batch functionality, remote interface, system size increases, and more.

It is our policy that a user shall be able to add and expand functionality online with appropriate planning.

In the event that a customer is adding new functionality supported by the DeltaV release their system is currently using, then the user should be able to add this functionality without interrupting the process. This means that the additions shall not disturb plant operations while the addition takes place.

Typical examples include:

- Adding more workstations
- Adding more controllers
- Adding an additional I/O carrier to an existing controller
- Adding I/O interfaces to an existing I/O carrier
- Adding devices to an existing FOUNDATION fieldbus segment
- Adding devices to an existing Profibus DP segment
- Adding devices to an existing AS-i segment
- Adding a serial interface to an existing controller without interrupting any of the I/O on the controller
- Adding serial devices to the serial interface where the serial interface protocol supports multiple devices on a bus
- Adding a control module to an existing controller without interrupting other modules running in the controller
- Replacing a function block control module with a new version without interrupting the outputs of the module
- Changing the order of execution of Function Blocks within a control module with disturbing the outputs of the control module.



## DeltaV Online Upgrades

An online upgrade allows updating a DeltaV system to the next system release without a process bump. Online upgrades do not disturb plant operations while the upgrade takes place. Online upgrades provide the ability for a long running process (many years) to migrate to newer revision levels of DeltaV software in order to take advantage of new technologies. An online upgrade consists of upgrading the firmware of redundant controllers and workstation software.

The goal of an online upgrade is to provide an EASY, SAFE, and RELIABLE method of upgrading a DeltaV system to the next release without disturbing process operations. In detail, this means:

- There shall be no process bumps. The process should not be upset by the upgrade or subsequent controller switchovers.
- No data loss should occur.
- The user shall retain complete control of the system while executing an online upgrade.

It should be noted that all DeltaV software should be upgraded during a single time window. While a system of mixed operator and controller versions is supported, the mixed-version state should be corrected as soon as possible. The upgrade procedure shall indicate those components that need upgrading so that the user does not inadvertently leave the system in a mixed-version state.

DeltaV releases take the form:

DeltaV version X.Y sp Z

Where

*sp Z* is a service pack. On rare occasions DeltaV shall require a service pack to correct items that need repair that exist in the software. It is the intention of Emerson Process Management to avoid the generation of these service packs by focusing on the reliability of the system software before it ships

*X* is a major release number. At the time of this publication, *X* may be 1,2,3,4 or 5. Typically, there is one major release every 8 to 12 months.

*Y* is a minor release. We attempt to minimize these releases and focus on the major releases. On occasion there may be a hole in the functionality released in a major release or even absent functionality that did not make the release candidate or beta trial. This would be addressed with a minor release or a service pack.

We support the following system upgrades

Version X.Y ➔ Version X.Y + 1 (or more)

Version X.Y ➔ Version X+1.Y

We will attempt to support an on-line upgrade for

Version X.Y ➔ Version X+2.Y

We do not support an online upgrade for

Version X.Y ➔ Version X+3.Y or higher

In the latter case one could go through a two-step or a multi-step upgrade.



## Components that may be upgraded online

During an upgrade, all components in a DeltaV system, or only some of them, might be upgraded. The following is a list of those that will likely be affected. Release notes will specify changes made for each revision.

### Workstation software

One should have at least two workstations that have the DeltaV Operator interface loaded on them. In small systems, two workstations are required (the configuration workstation that has operate capability and an additional operator station). In large systems, you should have two workstations per unit so that you can upgrade the workstations one at a time while maintaining full unit control from one workstation while the other is being upgraded.

Engineering software will likely be upgraded as well. Given that system configuration is an off-line activity, this software may be updated readily. Typically in an upgrade, the system comes first. Before new software is released it is thoroughly tested to ensure that the configuration of the old system is programmatically changed in to the right form for the new system, i.e. the upgrade software automatically changed the configuration database from vX.Y to vX+1.Y transparently to the user. This process is thoroughly tested at the factory.

The DeltaV system has certain fixed application programmer interfaces (APIs). For workstations, this includes OPC. Application packages that use this API in the DeltaV system will not have to be changed because this API is standard and remains unchanged.

In the event that a workstation is upgraded, it may have to be rebooted. This will interrupt all running functions on that station. While we attempt to avoid this, you should plan for its occurrence. **Users requiring online upgrades should have multiple workstations for each area of the plant**, so that one workstation may be upgraded while the other remains operational.

Using this technique, engineering, diagnostic and operate software may be readily upgraded.

### Controller firmware

**For an online upgrade, redundant controllers are required.** As functionality is added, controllers require that their memory be upgraded. This is done by a procedure referred to as flashing. During flashing, the controller will be upgraded while the primary controller controls the process.

### I/O firmware

It is the policy of Emerson Process Management not to change the firmware in I/O cards. Some versions of discrete cards cannot be upgraded so these are a non-issue. In the event that an I/O upgrade is needed, then the card is flash upgraded. While a card is flash upgraded, all inputs and outputs on the card are reset. This may take several seconds.

I/O cards are upgraded by a flash upgrade procedure (no EEPROM changing is required). A flash upgrade application known as the Controller and I/O Upgrade Application is provided for this purpose. This application will allow the user to flash upgrade the firmware of the controller from any engineering workstation. If speed is a factor, a physical swap of the I/O cards may be performed. During the flash upgrade or swap procedure, the channels on the cards will be reset. This means that it is possible for a number of channels to be disturbed at the same time in the event that simplex I/O channels are being flash upgraded. **For an online upgrade, where the I/O outputs cannot be bumped, then redundant I/O cards (available with DeltaV v6.x) should be deployed.**



In the event that you have redundant I/O installed, you may flash upgrade the standby card, followed by the primary card.

## Notes

- When you are upgrading a system, the system exists in a hybrid state. Example: if you are performing an online upgrade from DeltaV v4.2 to v5.1, there will be a period of time when the system is in transition between the two versions. You should not operate in this condition for an extended period of time.
- In a transition system (mixed controllers at different versions), only the upgraded controller configuration will be changeable by a configuration engineer.
- In a transition system, inter-controller communications shall continue.
- In a transition system, workstations shall be able to communicate and operate controllers of both versions.
- In a transition system, system diagnostics for both versions of controllers shall be available from any workstation.

## Implementation

When performing an online upgrade, always follow the instructions of Emerson Process Management personnel and/or follow the explicit instructions provided on the release CD.

**IT IS VERY IMPORTANT THAT YOU FOLLOW DOCUMENTED PROCEDURES PRECISELY.**

## Online Upgrade Limitations

Assuming your system has met these requirements, you should always check with Emerson Process Management personnel or the Emerson Process Management Knowledge Base before commencing an online upgrade. On occasion, last minute tips are made available for those about to upgrade their systems.

Some DeltaV applications may not be upgraded without interruption at this time. We do plan on changing some of these. For the current status regarding the applications below contact your local Emerson Process Management representative.

## History collection

During upgrade of an individual workstation, the history being collected on that workstation will be interrupted. The history will be interrupted only during the upgrade of that workstation. If maintaining history collection and viewing are necessary, simply reassign historical server data to another workstation.

## Batch processes

Online upgrade of a system while a batch is being executed is not supported. All batches must be completed. No batches can be in the queue and but there should be no batches running. (The nature of batch processes is such that there is typically an opportunity to accommodate this requirement). Following this procedure ensures that no batches are interrupted and that batch history remains intact. Be sure to back up the batch history database before upgrading the workstation where the historian resides.



## **Soft controllers**

If you are running supervisory control in one of the DeltaV workstations and you upgrade the workstation, the supervisory control will be interrupted for the duration of the upgrade. For this reason it is recommended that critical control be assigned to redundant controllers.

## **Ancillary applications**

The DeltaV suite of optional software includes DeltaV Inspect, DeltaV Tune, DeltaV Intranet Server, DeltaV OPC Server, DeltaV Excel Add-in, DeltaV OPC Pager. These applications are all workstation-resident and will be interrupted when the workstation that they reside on is upgraded. Some of these are client server applications: the application will be interrupted when either the client or the server workstation is upgraded.