



## Bailey® to DeltaV™ Systems Connectivity

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This paper describes the methods of implementation and the benefits of adding a DeltaV system to an existing Bailey legacy system installation.

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## Introduction

Bailey® legacy DCS systems have done their job over the years. However, system upkeep is increasingly expensive and requires dedicating personnel to address system concerns, find parts on e-bay and keep the system running. Knowledgeable vendor support has been declining over recent years. Their only migration offering is complicated to configure and difficult to use and maintain; it has not been proven and its reliability is questionable. How can you continue meeting market demands while operating these legacy systems?

Emerson offers excellent migration solutions that facilitate low -risk, low-maintenance system improvements that help you derive greater benefits from your existing Bailey system and plan for a full transition to the DeltaV™ system and PlantWeb™ *at your own pace*. Emerson personnel understand the Bailey systems and work with clients to determine the best options for your site, from total system replacements (in phased approaches) to standalone DeltaV systems for new plant areas. These standalone DeltaV systems can integrate with other plant systems more easily than can any other control systems. This paper describes how to connect the DeltaV system to Bailey systems and the benefits of each connectivity option.

How would you connect a Bailey DCS and a DeltaV system? The options are console upgrade, controller and I/O upgrade, various interoperability methods and advanced controls. Console upgrade makes DeltaV workstations the primary Human Machine Interface (HMI) for existing Bailey controllers and devices. Controller and I/O upgrade connects a DeltaV controller and I/O to Bailey I/O wire terminations; in this case, you will migrate the control and operating configurations to the DeltaV system.

Interoperability means bi-directional data exchange between the two systems. Each connectivity method introduces DeltaV advantages to the Bailey INFI 90®/NET 90 user, with minimal upset to normal operations.

## The DeltaV Advantage

### Digital Technologies

Expanding from traditional I/O to bus-based I/O is easy with DeltaV systems, which integrate CENELEC or IEC-compliant standard device busses. In a single DeltaV controller, you can combine classic or traditional I/O with HART®, Foundation Fieldbus, Actuator Sensor Interface (AS-i) bus, and Profibus DP, device I/O.

### Lower Field Device Maintenance Costs

For HART device users, the DeltaV system brings another advantage, the HART Pass-through and Asset Management System (AMS). Combined, these tools allow you to accomplish HART device startup, commissioning and maintenance much faster than with a Handheld 375. The following Table 1 and Table 2 quantify the savings.

Table 1. HART® Transmitter Commissioning Requirements Comparison

Activity	Handheld 375 Minutes Required	AMS/DeltaV Minutes Required	Savings*
Configuration	80	16	\$53
Wiring checkout	50	5	\$38
Point checkout	40	10	\$25
Documentation	40	0	\$33
Startup/commissioning savings (per transmitter)		179 minutes	\$149

\*Based on \$50/hr



Table 2. HART® Transmitter Maintenance Requirements Comparison

Activity	Handheld 375 Minutes Required	AMS/DeltaV Minutes Required	Savings*
Configuration	80	8	\$60
Calibration	50	27	\$19
Documentation	130	4	\$105
Startup/commissioning savings (per transmitter)		221 minutes	\$184

\*Based on \$50/hr

### Scalable System Architecture

DeltaV architecture provides the full range of functionality, from single PC to single controller systems to those controlling thousands of I/O points. An initial system could include a single valve and transmitter pair. You could later integrate this valve and transmitter into a plant-wide DeltaV system with no change in hardware. Traditional architectures simply cannot achieve this level of scalability.

*“...The I/O size that we can handle here is...around 1700 IO. If we bring in serial, of course, that would greatly increase the amount of IO. . . to build a comparable building to house that much I/O in a traditional DCS, you’d probably be talking around \$200,000 to \$250,000 just for the building.”*

Texas Eastman

For more about how companies got great results with the DeltaV system, visit [www.easydeltav.com](http://www.easydeltav.com)

### Console Upgrade—First Step toward Digital Plant Architecture

An older system console is one of the highest-risk items on an installed control system. These consoles have electronic components that are no longer being manufactured. They are neither expandable nor capable of interfacing with many current software applications or standard protocols. The DeltaV Connect™ Solution for Bailey® Systems is a tremendous, low-risk first step toward digital plant architecture.

This interface is designed to communicate with tags in the Bailey PCUs, so that operators perform the same tasks from DeltaV Operate workstations as they did from the Bailey consoles. In fact, setting up the new DeltaV Operator Stations side by side with the Bailey consoles eases the learning curve for operators.

After the DeltaV Connect solution is installed, at any time you can add DeltaV controllers and I/O to the same DeltaV network.



## Architecture

The DeltaV Connect solution interface connects to the Bailey Computer Interface Unit (CIU) in the same manner that a CIU connects to its Bailey console, via SCSI or RS232C. The DeltaV Connect for Bailey (DCB) interface is redundant, as shown in Figure 1.

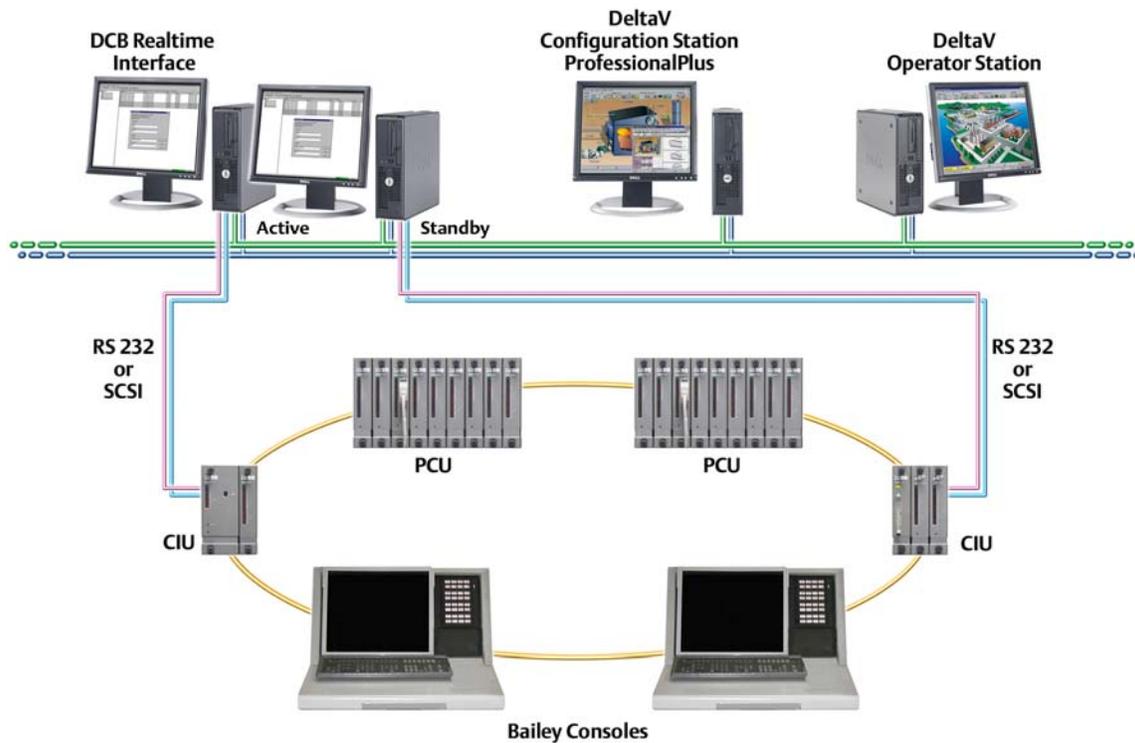


Figure 1. **DeltaV Connect™** Solution for Bailey® Systems Architecture

## Display Environment

The DeltaV Connect solution interface brings Bailey data into DeltaV tags, also called connect blocks. These tags have DeltaV standard functionality for alarm, history, trend and display on process graphics.

For easier configuration, the DeltaV Connect solution includes faceplates that correspond to the connect blocks. These faceplates present the same data that you see on the Bailey consoles. Figure 2 shows Bailey faceplates appearing on a DeltaV Operator Station.

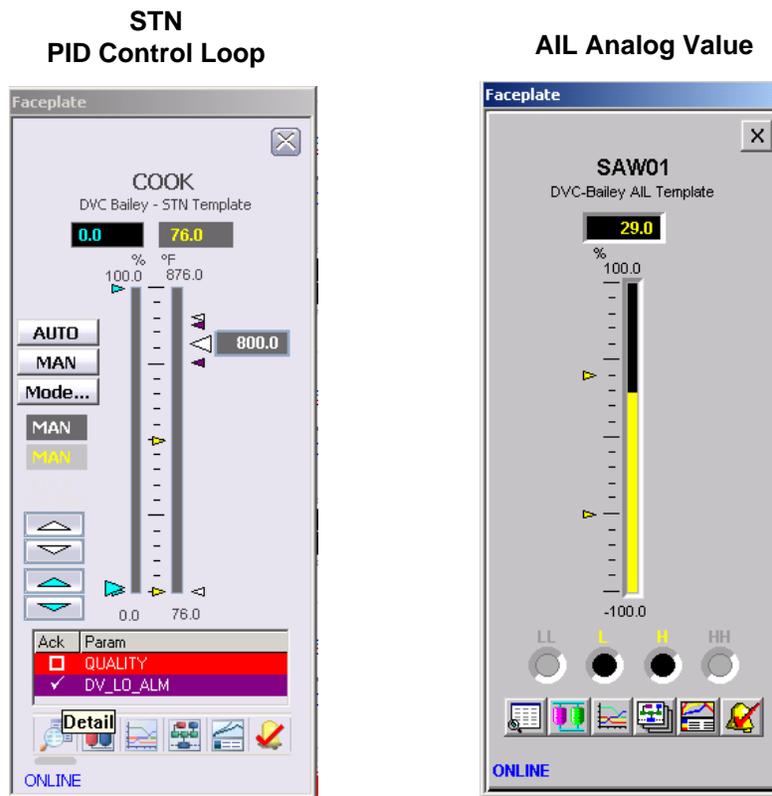


Figure 2. Bailey® faceplates on the DeltaV™ Operator Station

Emerson offers services to expediently generate accurate Bailey display reproductions and Bailey console tag database conversions for immediate use in the DeltaV Connect solution. Emerson personnel who are familiar with both systems oversee and check all conversions. This process and, particularly the automated conversion tools, sharply reduce opportunities to introduce errors during interface configuration.

The results of the conversions are quite satisfactory. The database conversion generates 100% of the modules needed in the DeltaV Connect solution interface. Graphic displays carry the same primary objects and layout, with standard DeltaV toolbars for one-click navigation to other displays. Figure 3 shows a sample converted Bailey system display, as it appears on a DeltaV Operate workstation.

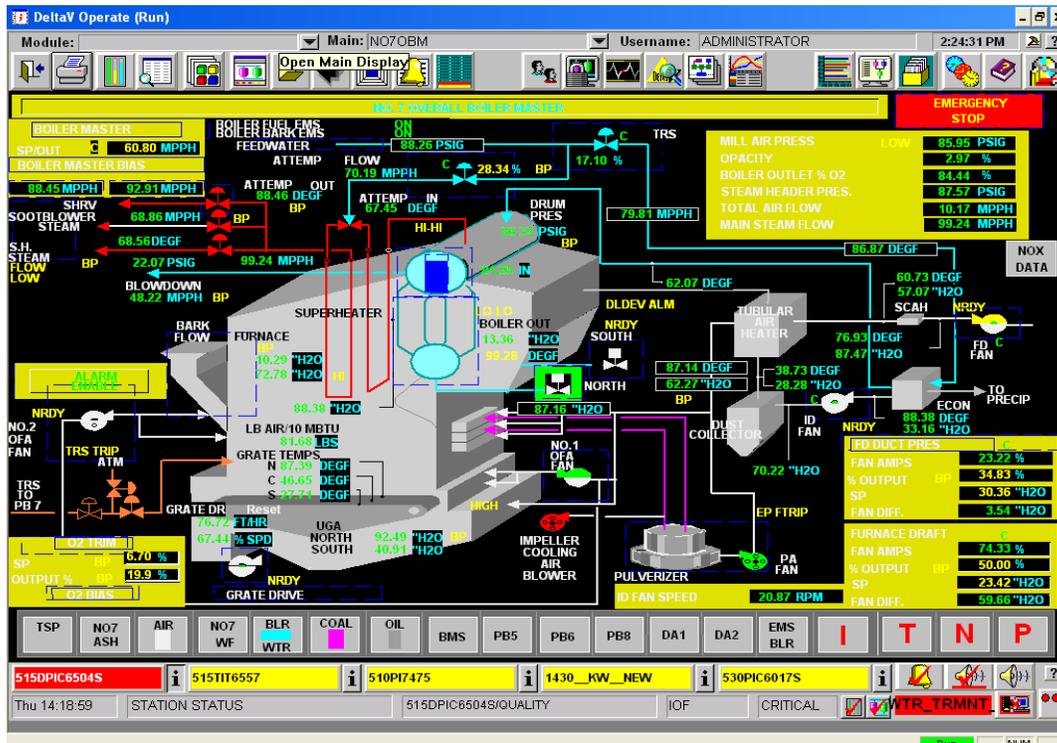


Figure 3. Converted Bailey® Display on a DeltaV™ Operate Workstation

For more information about display and database conversion services, please see the Bailey to DeltaV Services data sheet at <http://www.easydeltav.com/Solutions/DCS/>

Manual display build on a DeltaV workstation is quite easy and may be the preferred method for Bailey system users who want to enhance the process graphics, and/or define and implement a new plant graphic standard.

### Benefits of the DeltaV Connect Solution for Bailey Systems

- Startup is low-risk with **no** downtime.
- Configuration is easy, fast and intuitive for Bailey users.
- Configuration is accomplished using standard DeltaV engineering tools.
- Consoles from both systems can operate side by side.
- Operators learn software quickly, with look-alike HMI displays.
- Field device maintenance is more effective, as operators and maintenance personnel gain access to HART or bus device information at the DeltaV system consoles.



- It lays the foundation for system expansion with DeltaV controllers and I/O added onto the same DeltaV network.
- Expansions can include the latest bus and smart device technologies.
- It facilitates moving Bailey batch phases and/or recipe management into DeltaV Batch

To learn more about the DeltaV Connect Solution for Bailey Systems, visit <http://www.easydeltav.com/Solutions/DCS/>

## Controller and I/O Upgrade and Expansion

When the Bailey controllers and I/O are to be replaced, while field devices are not being replaced, the DeltaV controllers can connect to the Bailey system’s I/O terminations. This is done using FlexConnect® solutions, a special set of cables, interface panels and/or pass-through cards that transform Bailey field wiring terminations into DeltaV terminations.

### Benefits

The most compelling FlexConnect solution benefit is the dramatic reduction in downtime—which can be 75% or more—versus rewiring. Another benefit is lower wiring costs: they drop by 50% when using this solution, versus completely rewiring. Table 3 shows wiring costs for a conventional switchover, based on 640 I/O channels.

Table 3. Cost impact of A 640-channel system switchover, conventional method

Switchover Activities	Impact
Disconnect old terminations	5 minutes/channel
Remove old terminations; Install new terminal blocks; Re-terminate wires	8 minutes/channel
Wire from new terminal blocks to DeltaV system	10 minutes/channel
Document	20 minutes/channel
Total time required per channel	43 minutes/channel
Total installation time for 640 channels	458 hours
Labor costs @\$50/hour	\$22,900
Downtime (not including documentation time)	20 days

Table 4 shows wiring costs using FlexConnect solutions. Compare the downtime with that listed in Table 3.

Table 4. Cost impact of A 640-channel system switchover using FlexConnect® solutions

Switchover Activities	Impact
Install FlexConnect panels	2 minutes/channel
Install inter-connect cables	4 minutes/channel
Document	4 minutes/channel
Time required per channel	21 minutes/channel
Total installation time for 640 channels	224 hours
Labor costs (\$50/hour)	\$11,200
Downtime (not including documentation time)	5 days

When planning the installation and startup of the DeltaV system with an existing Bailey system, the FlexConnect solution makes a phased implementation entirely feasible. Phased startups let you plan and execute switchover of your most critical plant areas first, while keeping other areas running.

### Architecture

FlexConnect solutions connect Bailey I/O terminations to DeltaV controller I/O, and precise structures vary with the type of system and the type of I/O. Figure 4 shows the architecture of a FlexConnect solution for Bailey INFI 90 / NET 90 analog inputs.

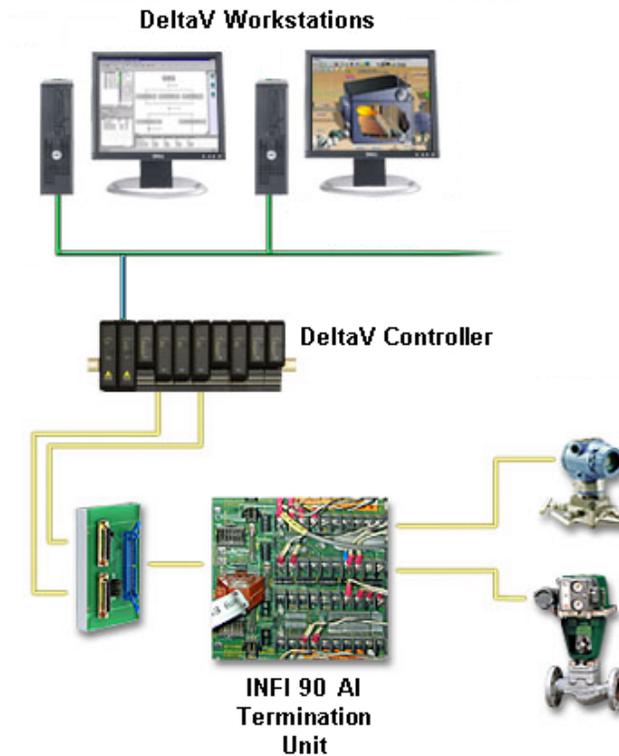


Figure 4. DeltaV™ FlexConnect® Solution for INFI 90®/NET 90 Analog Inputs

Table 5 lists the types of I/O supported in DeltaV FlexConnect Solutions for INFI 90/NET 90.

Table 5. INFI 90®/NET 90 I/O terminations with FlexConnect® solutions

Description	Model
Controller/Station Termination Unit	NTCS02/04
Analog Input Termination Unit	NTAI01/05
Analog Output Termination Unit	NTAO01, NTDI01
Digital I/O Termination Unit	NTDI01
Digital Output Termination Unit	NTDO01/02



## Interoperability

Bailey and DeltaV systems can share data via two methods. The OLE for Process Control (OPC) interface is a console-based interface that allows bi-directional data exchange between the two systems. A serial interface (Modbus protocol) enables data exchange directly between Bailey Plantloop/INFI-NET and a DeltaV system.

## OPC for Data Exchange between Bailey and DeltaV Systems

OPC was developed to simplify the task of sharing data between systems with different operating systems and data types. The OPC server gets data from a control system and puts the data into a standard format, to be read by an OPC-compliant client. Normally, a server provides data to clients only; the DeltaV OPC Mirror enables data sharing between OPC Servers. From the mirror, an OPC-compliant client application can then see data from the INFI 90/NET 90 and the DeltaV system, in one common format.

### Architecture

The OPC implementation consists of one Bailey system OPC Server on a PC/station connected via Ethernet to a DeltaV Application Station, running the DeltaV OPC Server and OPC Mirror.

### Benefits

- OPC Mirror can link to all plant subsystems with OPC Servers, in addition to the Bailey control system.
- One common interface protocol can link historian or information management software to multiple process control systems.
- Application selection is by functionality and is not restricted to those that conform to a proprietary protocol.
- Control can be bidirectional; control Bailey points from a DeltaV workstation and from a Bailey console, control DeltaV points.
- Integration is seamless for Microsoft and other OLE compliant applications.

## Serial Interface

The DeltaV Connect Solution for Bailey Systems uses the CIU, which is the best connection point for access to data across the entire Plantloop or INFI-NET. However, you can also exchange data directly between a Bailey controller and a DeltaV controller using a serial interface. The controller serial links are practical for small to medium-sized applications.

### Architecture

An effective serial connection between controllers requires a Bailey Multi Function Controller/Processor (MFC or MFP series), its serial port termination unit, and interface programming in C, C++ or BASIC language. The DeltaV system requirements are a serial communications I/O card, termination block and the appropriate (Modbus) protocol software.

The Bailey controller is dedicated for this serial connection. The controller will have the interface driver program and user-configured function blocks to make the data available for other modules and PCUs on the network. In order to see these new tags on Bailey operator consoles, you also need to configure exception report blocks in this controller.



## Benefits

Such a serial link brings tag data directly into the controller (the virtual controller in the case of DeltaV Connect). Therefore, the new DeltaV tags have full access to operability features. Another advantage of this link is the ability to control Bailey system devices from a DeltaV console and vice versa.

DeltaV plug-and-play serial connectivity extends to any device supporting a serial interface protocol such as Modbus, Modbus Plus or Allen Bradley's Data Highway Plus. The interface installs quickly, with Modbus drivers already on board. After you connect your serial device, the DeltaV controller auto-senses the serial connection and the system presents configuration options for the interface. Online help makes this configuration easy.

## DeltaV Advanced Controls

Two powerful DeltaV advanced control applications are supported "standalone", meaning no DeltaV controller hardware is required, with non-Emerson systems. These are DeltaV Neural, an inferential sensing package, and DeltaV Predict or Predict Pro, a multivariable process control package that can help manage interactive loops for improved process performance.

### Architecture

Two architectures support the use of DeltaV advanced controls with your Bailey system:

1. DeltaV Neural or Predict can run in a DeltaV Application Station.
2. DeltaV Neural or Predict can run in a DeltaV hardware controller.

For either implementation, connecting to the Bailey ring network requires one of the previously described methods: DeltaV Connect Solution for Bailey Systems console upgrade, OPC interface, or Serial interface. Alternatively, with the DeltaV hardware controller implementation, you can wire directly from the field devices.

### Benefits

By implementing DeltaV Advanced Control applications, you can improve process performance and product quality without major re-work to your existing Bailey controls.

More DeltaV advanced control applications, such as DeltaV Insight and Fuzzy Logic are embedded in DeltaV controllers. To learn more about embedded DeltaV Advanced Controls, see <http://www.easydeltav.com/keytechnologies/advanced>

## Managing Risk

With a new DeltaV system, you have several options that can help ease the adjustment and minimize errors in the early learning phases. One of the first considerations is the type of people who will manage and execute the transition. Emerson offers a suite of services to help make all control system transitions successful. Emerson engineers and project managers are experienced with Bailey-to-DeltaV upgrades. They have implemented successful hot cutovers, as well as performed site checkout and system startups during tight turnaround periods. For details about how customers have benefited from Emerson expertise when upgrading from their Bailey systems, visit <http://www.emersonprocess.com/solutions>.

Other considerations are training your personnel and providing tools that facilitate quick adoption of the new technologies. As your project progresses, with DeltaV database configuration and graphics complete, you will have the tools needed for training operators on the new system. DeltaV Simulate Pro can provide realistic field responses to operators without connecting to real I/O. In a safe and virtually risk-free environment, operators can



practice running the familiar process from the new DeltaV system. For all system sizes, Operator Training Solutions (OTS) are available to suit the specific needs of your site and personnel. Emerson also offers custom courses either at your site or in their training centers. For more information about these powerful training systems, please see [http://www.easydeltav.com/pd/PDS\\_DeltaV\\_OTs.pdf](http://www.easydeltav.com/pd/PDS_DeltaV_OTs.pdf). Reference sites are available for all of the solutions described in this white paper.

## Conclusion

Successfully implementing Bailey-to-DeltaV system connectivity enables you to:

- Establish a path toward digital plant architecture now
- Pace the transition from older to newer technologies
- Replicate familiar operations displays on the newer consoles
- Save engineering configuration time through use of conversion tools
- Train operators and verify configuration in a risk-free, offline environment
- Minimize process downtime during a switch of process control IO between systems
- Save existing wiring and avoid costly re-wiring and the risk associated with it

DeltaV systems connectivity brings great new possibilities to the Bailey NET 90 or INFI 90 user. Coupled with the expertise of Emerson personnel, the DeltaV system enables you to maximize process potential while minimizing transition costs.