Configuring PlantWeb Alerts in a DeltaV System

This document provides information on field device alerts in a DeltaV system. In the context of a DeltaV system these alerts are referred to as PlantWeb Alerts

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Introduction

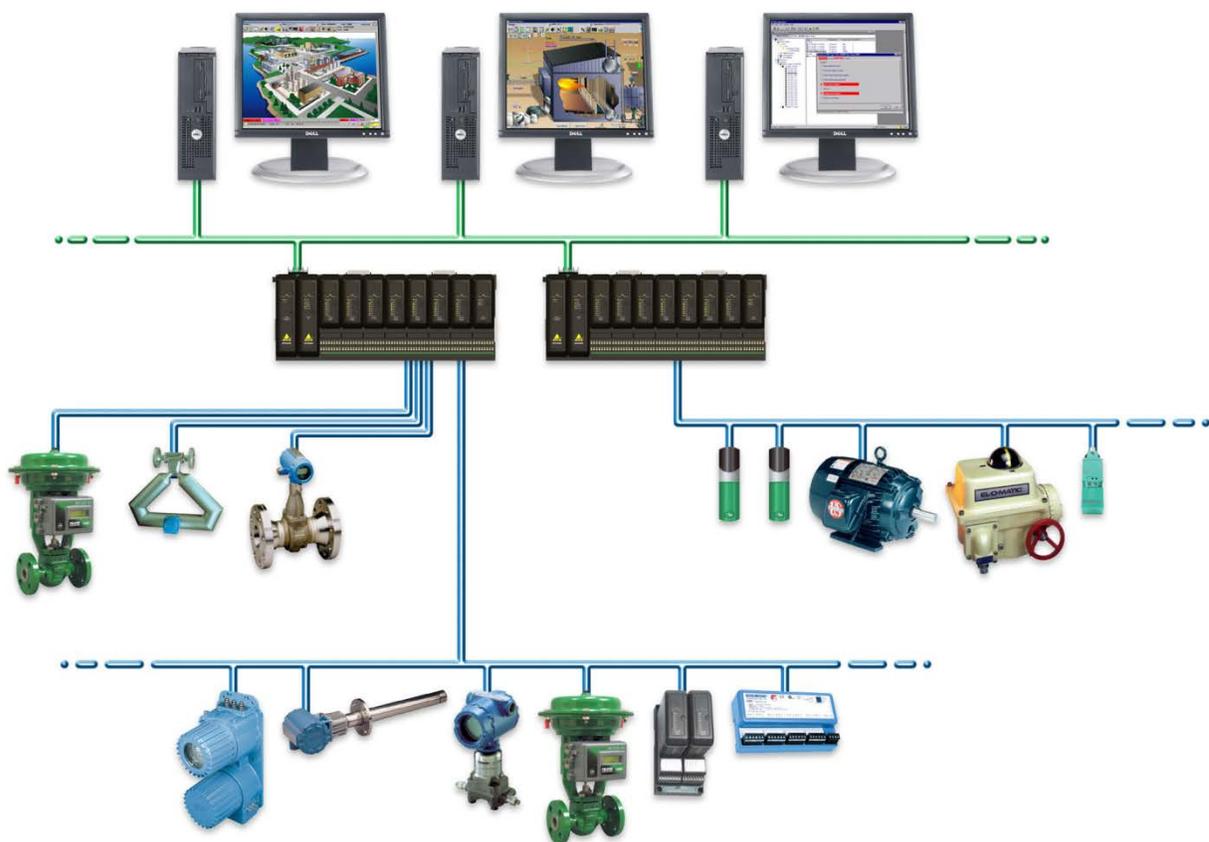This document provides information on field device alerts in a DeltaV system. In the context of a DeltaV system these alerts are referred to as PlantWeb Alerts. PlantWeb Alerts are available for both FOUNDATION fieldbus and HART devices. PlantWeb Alerts in Emerson devices provide consistent, predictive device condition monitoring and reporting. PlantWeb Alerts can notify users of potential field device issues before they impact the plant's process.

Historically, control systems generated alarms only when process conditions deviated too far from normal operation. These traditional process alarms typically do little to identify the root cause of the problem, such as the condition of the field devices monitoring or directing the process. PlantWeb Alerts provide the framework for reporting the health of a device and its ability to perform its primary task. Rather than allowing the device to degrade until failure impacts production, corrective action can be taken to avert unnecessary plant shutdowns or losses due to production quality.

PlantWeb Alerts are implemented in a DeltaV system as a separate alarm subgroup. This enables the system to target them to the right personnel. There are many different operational philosophies with respect to alarming. PlantWeb Alerts enable users to adjust the system behavior to meet their specific needs.

PlantWeb Alerts should be introduced methodically to a DeltaV system, to avoid inappropriate notifications to operators who either have no action to take when alerted or who have not been trained to respond. When properly deployed, PlantWeb Alerts can significantly improve system availability and reduce unscheduled outages.

This paper assumes that the reader is familiar with the DeltaV field device definition and the alarm management system, including the definition of alarm priorities, as well as the function of plant areas within the alarm management scheme. For additional information on these features of the DeltaV system, please refer to Books Online, System Alarm Management.

PlantWeb Alerts within the DeltaV System

PlantWeb Alerts are implemented in the DeltaV alarm management system as device alarms. Most control systems use one mechanism to report process-related alarms and a different mechanism for reporting system hardware health or integrity. PlantWeb Alerts expand the scope of system health to cover the field devices. The DeltaV system has incorporated the device and system hardware integrity alerts within the alarm management system to provide a consistent mechanism for handling all alarms and alerts in the system.

PlantWeb Alerts in Foundation Fieldbus Devices

Fieldbus devices detect and report various conditions to a host system. These conditions range from hardware failures and sensor or control problems to proactive reporting of upcoming maintenance requirements. The device manufacturer determines whether a particular device condition can be suppressed, disabled or configured through the host system.

Standard Foundation fieldbus device conditions are reported through a single alert type, ABNORMAL. The device sets one of the bits in the standard block alarm on the resource block. Since all conditions are reported by the resource block under the same alert and with the same priority, it is difficult to distinguish which conditions are actionable by either operators or maintenance personnel.

Emerson Foundation fieldbus devices that support PlantWeb Alerts, together with the DeltaV system software, can accurately target device conditions to operators or maintenance personnel as appropriate. The system can also route lower-priority alerts to historical logs for later review. Foundation fieldbus devices that support PlantWeb Alerts and the DeltaV system each play an important role in delivering PlantWeb Alert functionality.

The Ff devices detect device conditions, map conditions to an alert type, and report the alert to the host system. Depending on the particular device and version, individual conditions may be enabled or disabled, given a different threshold, or be reassigned to a different alert type.

The DeltaV system reports these alerts through the system and maps the alert types to DeltaV alarm priorities. This ensures that device conditions are properly represented and reported to operators, maintenance personnel, the Event Chronicle, and so on.

Note that Foundation fieldbus standard FF912 introduces a fieldbus device alert standard which, like PlantWeb Alerts, specifies a hierarchy of alert types. Emerson is monitoring development of the new standard with the expectation that it will result in future DeltaV system updates for adaptation and harmonization with PlantWeb Alerts.

PlantWeb Alerts in HART Devices

The same four PlantWeb Alerts (FAILED, MAINTENANCE, ADVISORY and COMMUNICATION) are offered for all HART devices, based on the standard HART status conditions.

However, in contrast to Foundation fieldbus devices, HART devices do not support local alarms: HART devices do not report alert conditions proactively to a host system. HART devices must be polled to determine which device conditions are active or have been cleared. For HART devices, alert condition configuration, annunciation and reporting are managed in the DeltaV system, not the device. (HART 7 introduces new types of device reporting that are primarily driven by Wireless HART. PlantWeb Alerts work with HART 5, 6 and 7 devices.)

DeltaV Hardware and Software Requirements

PlantWeb Alerts were first introduced in DeltaV v6.3 with Foundation fieldbus devices from Emerson divisions. Later, PlantWeb Alerts were extended to HART devices connected to SIS Logic Solvers in v8.3. Then in v9.3, PlantWeb Alerts were implemented on all HART-enabled devices.

From a hardware perspective, the Series 2 H1 card is required to access PlantWeb Alerts in Foundation fieldbus. HART-based PlantWeb Alerts require Emerson MD/MDPlus or later controllers.

PlantWeb Alert Classifications

PlantWeb Alerts are used to classify and report device diagnostic conditions in a proactive, meaningful structure that helps the user respond appropriately. Each device within the DeltaV system has the ability to report these alerts.

Device alert conditions are organized into three PlantWeb Alerts, based on the impact of the condition to the health of the device. A fourth communication alert is created by the DeltaV system, based on the ability to communicate with the device.
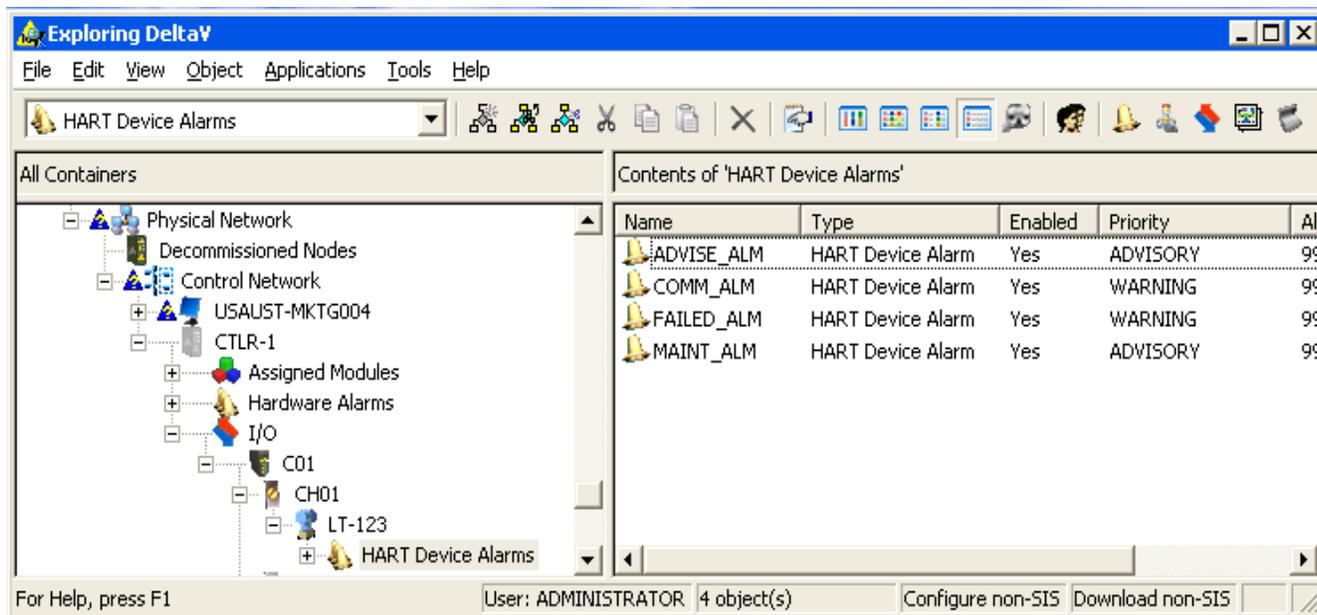
Figure 1 HART Device Alarms

■ **FAILED (FAILED_ALM)**—The device is not able to perform its primary function and is probably impacting the process.

■ **MAINTENANCE (MAINT_ALM)—**The device is impaired and may be impacting the process.

■ **ADVISORY (ADVISE_ALM)—**The device is in need of preventive maintenance or has information to be recorded.

■ **COMMMUNICATION (COMM_ALM)—**The device is no longer communicating on the H1 segment or HART channel.

The PlantWeb Alerts are also assigned a priority in order to manage which alerts are annunciated to the operator. From a device perspective, the impact of an alert condition would be the same in all instances of that device type, but the impact to production or product quality could be quite different, based on how the device is used. The alert priority can therefore be used to elevate those device alerts where prescribed actions should be taken in the event of the PlantWeb Alert activation.

These four alerts are made visible through DeltaV Operate alarm interface tools such as the alarm banner and the alarm summary object. These tools allow alarms to be separated into dedicated lists using filters that look at the alarm source, assigned plant area, associated unit or module, and assigned priority. Because alerts are part of the alarm management system, they can be combined into broadly scoped lists or isolated into a very specific list, even to a single device.

PlantWeb Alert Implementation

The DeltaV system has built-in default settings to help you take advantage of PlantWeb Alerts with minimal effort. This section provides information about the prioritization and distribution of alerts throughout the system to help you customize the settings according to your operational requirements and alarm management strategy.

The implementation of PlantWeb Alerts should be included in the plant alarm philosophy so that all devices are configured in a consistent fashion and so that alerts are meaningful to those who receive them. The alarm philosophy defines the alarm priorities and their criteria for use within the system. The DeltaV system defines three alarm priorities by default and supports up to twelve different priorities.

To understand PlantWeb Alerts, it is important to understand some of the basic functions of the DeltaV alarm management system.

- **Plant Areas –** The alarm system uses plant areas to target alarms and alerts to specific workstations and users, defining the scope of control for the user at each workstation. Every control module, device tag and DeltaV hardware component is associated with a plant area so that its alarm or integrity information can be targeted to the right user.

- **Alarm Priorities –** Each alarm and/or alert needs a defined priority. The priority is an indication of alarm importance and typically reflects several factors such as consequence of inaction and time to respond. The alarm system uses priority to determine which alarms or alerts are displayed in the alarm banner and the order alarms are listed in the alarm summaries.

- **Alarm Annunciation –** The DeltaV system groups alarms based on their source (process, device, hardware). Within a specific workstation's alarm banner, these alarm groups are filtered by priority to match the primary task of the current user. Only alarms with sufficient priority are annunciated to the operator through the alarm banner, where the alarm horn is triggered and the alarm is acknowledged by the operator.

The DeltaV system provides a default alarm management scheme for PlantWeb Alerts. Only the **Device Failure** and **Communication Failure** alerts are annunciated to the operator because these reflect a loss of monitoring or control of the process. All other PlantWeb Alerts are reported for reference and are primarily intended for maintenance personnel. All devices assume the same plant area as their associated control modules so that wherever a module is operated, all related device alarms are also available, but not necessarily annunciated.

Some customers may want to change the PlantWeb Alert reporting, based on the criticality of service of certain devices or have all alerts annunciate to the operator because of their particular work practices. Whatever the reason, the DeltaV system allows you to modify the presentation of PlantWeb Alerts to meet your needs, along with tools to help facilitate the implementation phase.

The remainder of this document focuses on PlantWeb Alerts and their implementation within the DeltaV system.

Plant Area Assignment

The DeltaV alarm management system uses Plant Areas to determine where alarms are available and who will see them. This is true for both process alarms and PlantWeb Alerts.

Initially, when the device is created and assigned to a controller's I/O subsystem, it assumes the plant area of the controller. If the device is used for SCADA communication without a control module reference, the PlantWeb Alerts report to the same workstations as the controller's integrity data, or hardware alerts.
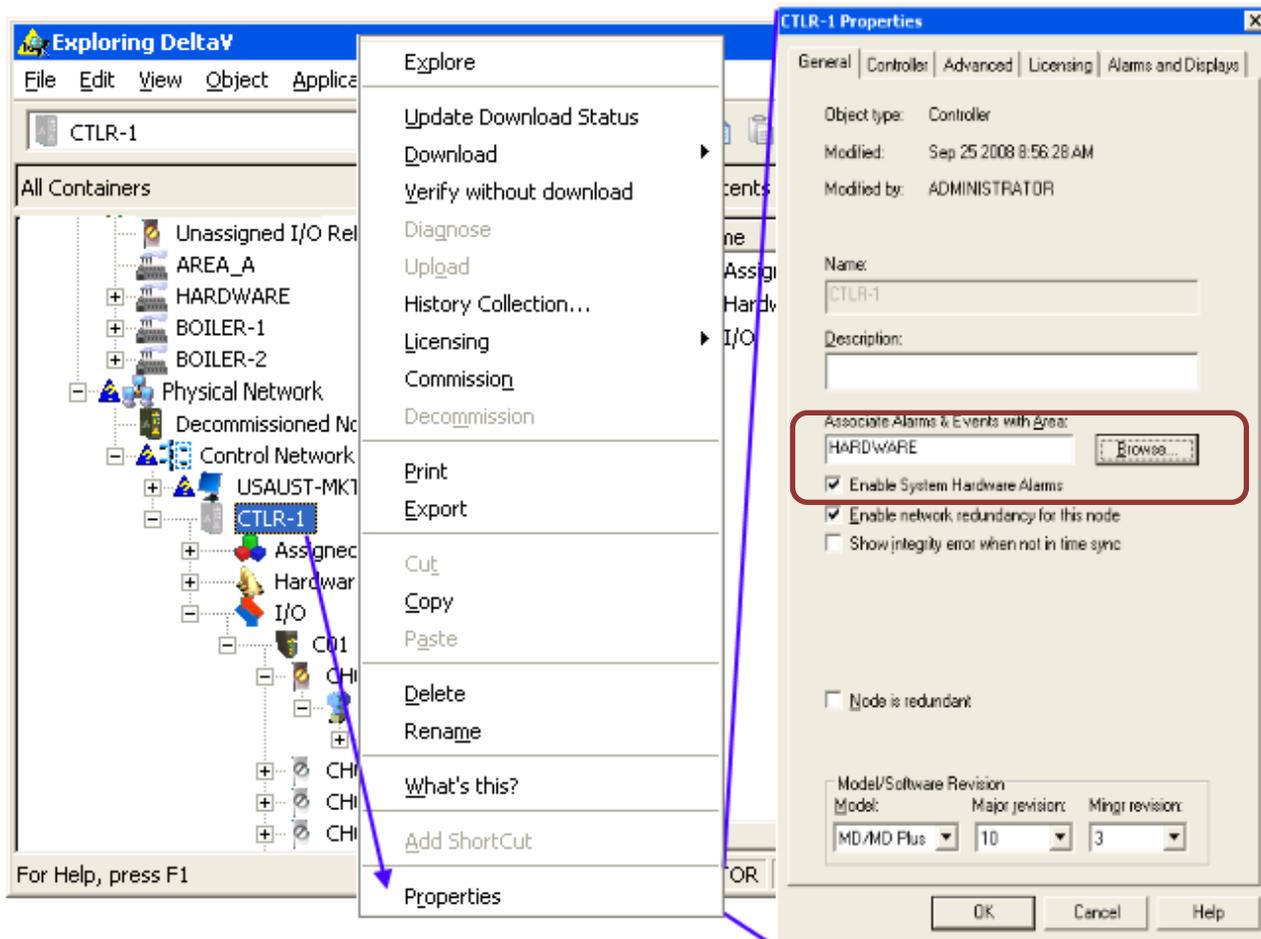
Figure 2 Controller Alarm and Events Area Association for Integrity Reporting

When the field device is referenced by a control module, the DeltaV system automatically assigns the device to the module's plant area. This ensures that the process alarms of the module and the PlantWeb Alerts of the referenced devices all report to the same operator stations. Even if the PlantWeb Alerts do not annunciate in the alarm banner, the operator has access to all the device condition information through the appropriate alarm summaries.
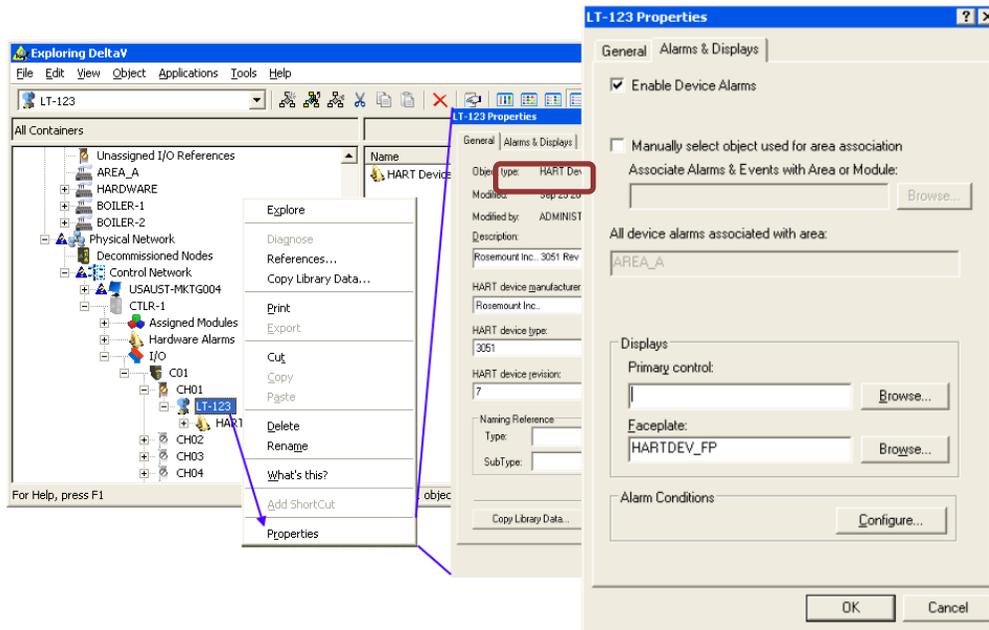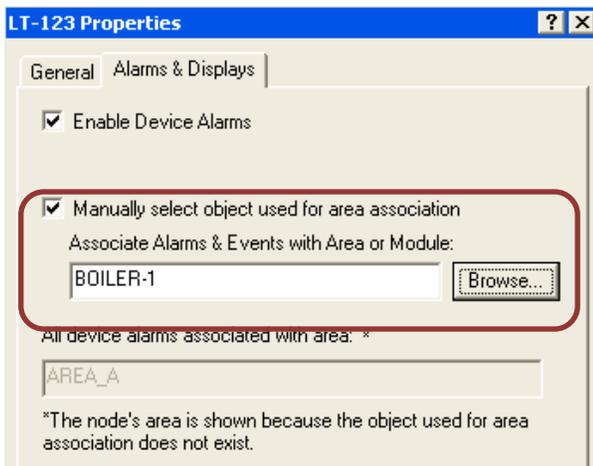
Figure 3 HART Device Area Association for PlantWeb Alert Reporting

The plant area assignment is automatic and does not require any intervention on the part of the configuration engineer. It is important to have a consistent plant area association strategy because this governs where alarms and events are reported, including history collection. The default strategy in the DeltaV software ensures that all alarms and events of a physical process area are reported together and collected in history as a complete set. Assigning PlantWeb Alerts to separate areas from the referencing control modules requires additional management and configuration to direct the alerts to the correct destinations. Consider carefully whether to deviate from the default implementation because this could create additional alarm management and configuration.

To manually override the associated alarms and events area, open the device properties dialog, select the check box and manually define the desired plant area or control module.

Enabling PlantWeb Alerts

By default, the DeltaV system enables PlantWeb Alerts when a device is created with the option **Enable Device Alarms** in the device properties dialog. Changing this setting requires a download to the controller. Disabling the device alarms also disables the communication alert.

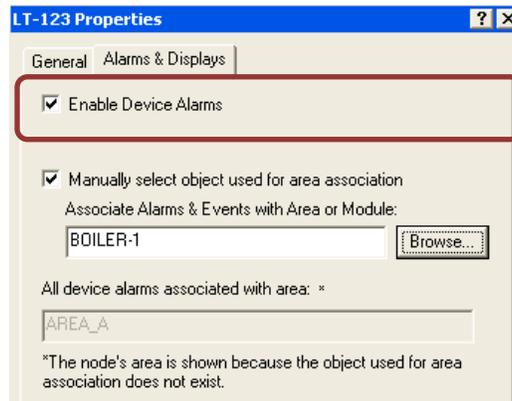**Note:** Migrated systems will not automatically enable these device alarms.

Figure 4 Enable Device Alarms Option

To address occasional operational requirements, individual PlantWeb Alerts can be disabled or suppressed at runtime as shown below, without the need for controller download.
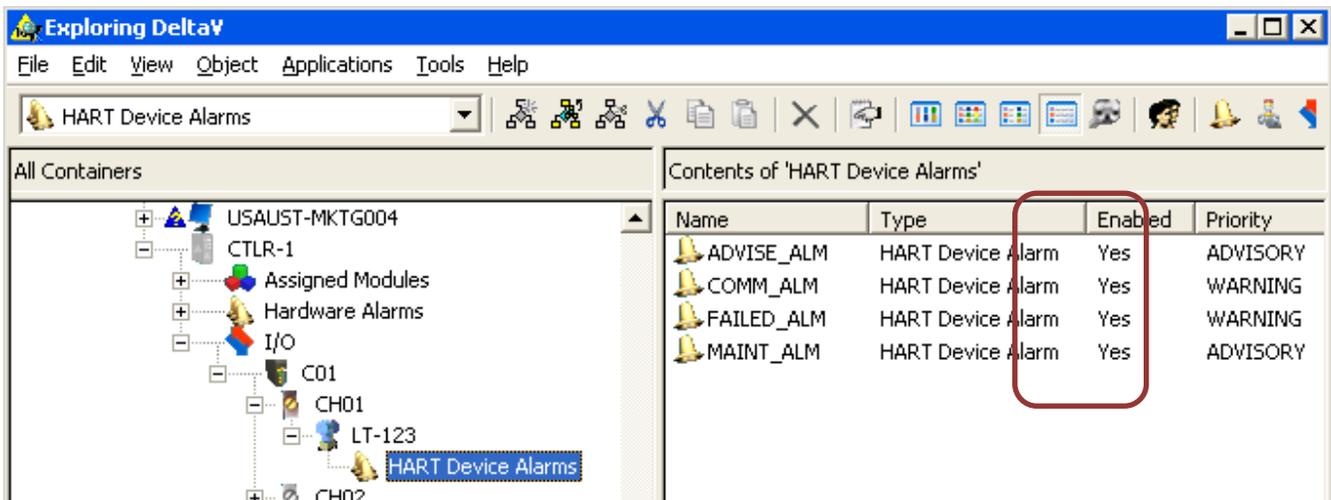

Figure 5 Disabling Individual PlantWeb Alerts

Setting PlantWeb Alert Priority

Most users will find that the default alarm priorities associated with PlantWeb Alerts in the DeltaV system are appropriate. If your alarm philosophy calls for a different priority scheme for your PlantWeb Alerts, you can easily change the priority assignments.

The DeltaV system provides an optional advanced setting to re-assign the alarm priority of PlantWeb Alerts for individual devices, to fine tune the alarm system according to your plant alarm philosophy and to the criticality of the associated process.
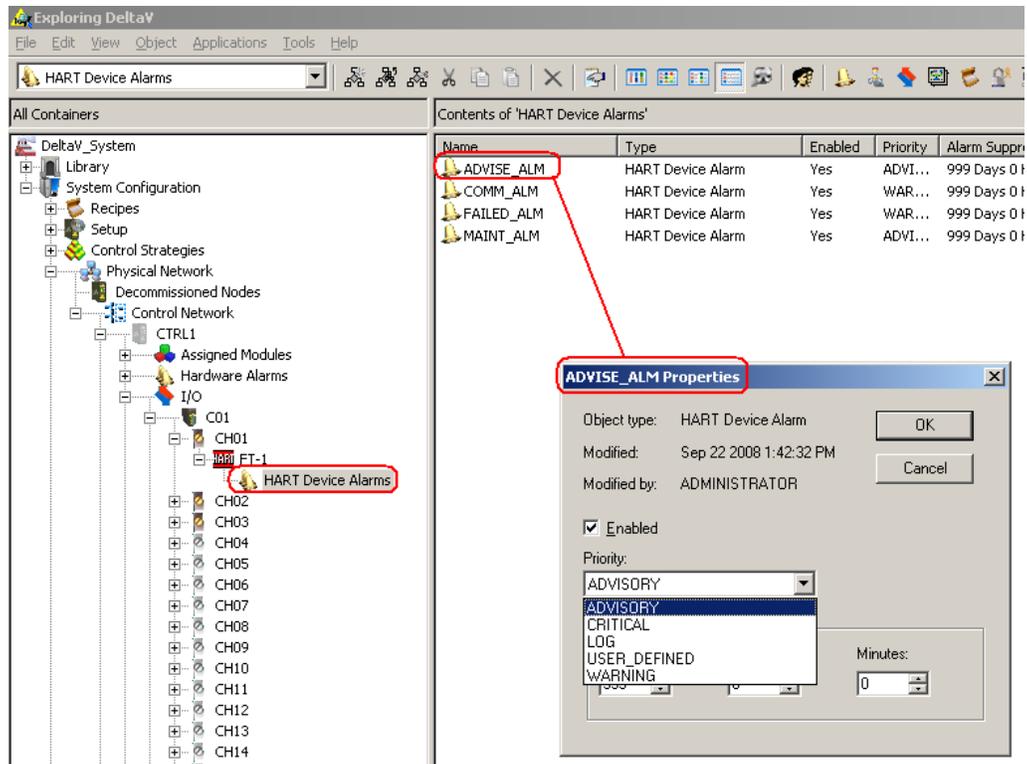
Figure 6 Changing PlantWeb Alert Priorities

Note: The alert priority is used only within the DeltaV alarm management system. When viewing devices in AMS Device Manger, device conditions are grouped by their assigned PlantWeb Alert, but they are all presented equally

Presenting PlantWeb Alerts to the Operator

Recapping the previous sections, HART and fieldbus device conditions are grouped into PlantWeb Alerts **(ADVISORY, MAINTENANCE, FAILED,** and **COMMUNICATON),** and each device is assigned to a plant area with DeltaV alarm priority levels assigned to each of the four alert types. In this section we see how alarm priority is used by the DeltaV Operator Station and Maintenance Station to assure PlantWeb Alerts are matched to the roles of operators and maintenance staff.

You may recall that each DeltaV alarm priority is assigned a designated numeric weight, from 3 to 15, as seen here. The numeric value is important because this is what the filters in the alarm banner and alarm summaries use.
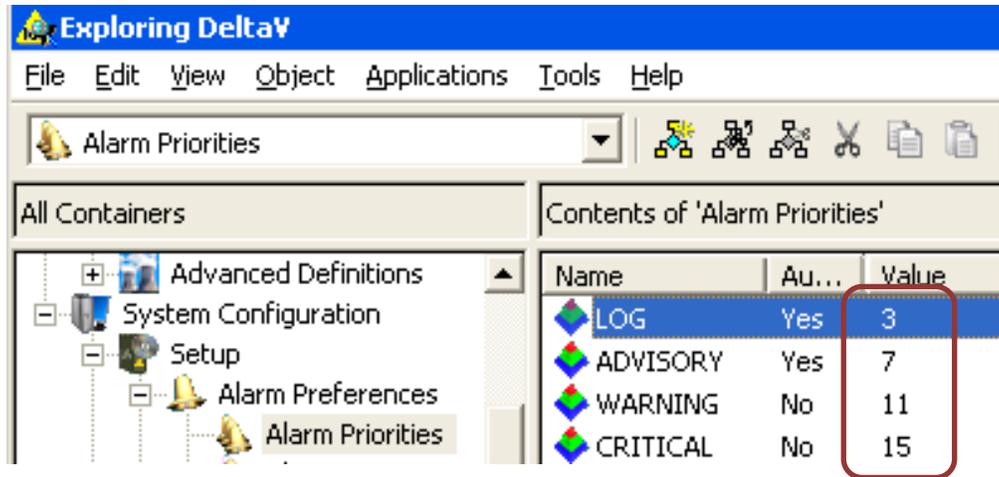
Figure 7 Alarm Priority Numeric Values

The alarm banner settings of each DeltaV workstation determine which alarms (PlantWeb Alerts, process alarms and hardware alarms) are annunciated, according to the source and numeric priority of the alarm. To annunciate means to sound the horn and show the alarm in the alarm banner and alarm list.

The DeltaV system default settings for PlantWeb Alerts are based on the assumption that operators are interested in *all* **process alarms** but are interested only in higher priority (8 to 15) **device conditions.** The following shows the default priority assignment for PlantWeb Alerts.
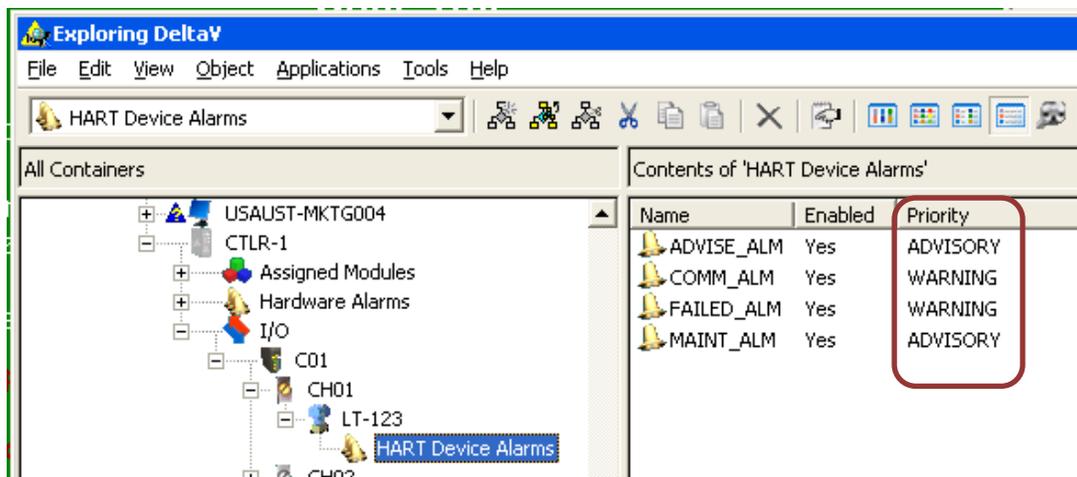

Figure 8 PlantWeb Alert Priority Assignment

The DeltaV workstation default settings for the alarm banner are as follows:

Table 1. Default Workstation Alarm Annunciation Settings

Alarm Source	Log Only (3)	Advisory Priority (7)	Warning Priority (11)	Critical Priority (15)
Process Alarm	Log Only	Annunciate		
Device Alarm (PlantWeb Alerts)	Log Only	Report Only	Annunciate	
Hardware Alarm	Log Only	Report Only	Annunciate	
SIS Process Alarm	Log Only	Annunciate		
SIS Device alarm (PlantWe	Log Only	Report Only	Annunciate	
SIS Hardware Alarm	Log Only	Annunciate		

The alarm banner priority thresholds are set in the **User_Settings.grf** file. Refer to Books Online for information on how to modify these settings for the system or for individual workstations.

The DeltaV system's alarm presentation is set up by default to show all process alarms to the operator and only higher-priority PlantWeb Alerts in an Operator Station alarm banner. In contrast, the Maintenance Station is designed to show only device alerts (not process alarms) in the alarm banner. If this matches the plant's philosophy, then the system defaults should require little modification.

There are also specific preconfigured alarm summaries that allow anyone to see all alarms and/or alerts currently active in the system. These can be used to display all PlantWeb Alerts to the operator, including those that do not annunciate through the alarm banner.

The DeltaV Maintenance Station uses the same default alarm banner settings as the Operator Stations, but it only shows PlantWeb Alerts. The Maintenance Station does not have a DST size in its licensing, so all plant areas can be assigned to one station in order to manage all device level alarms from this single node. However, no process alarms are shown in the alarm banner or alarm summary of the Maintenance Station.

Customizing HART PlantWeb Alert Conditions

PlantWeb Alerts deliver maximum value with a minimum configuration effort. Some FOUNDATION fieldbus devices do offer the ability to change the condition mapping to customize the PlantWeb Alert behavior using the AMS Device Manager application. Similarly, the DeltaV implementation for HART-based PlantWeb Alerts provides a mechanism for customizing the alert mappings of the HART device conditions. However, the HART PlantWeb Alert conditions are defined in the device EDDL file used by AMS Device Manager. If the DeltaV mapping is altered, AMS Device Manager will not be not aware of the change, which results in an alert condition reporting to the DeltaV workstation as one PlantWeb Alert, but displayed in AMS Device Manager under the original alert mapping.

The **Alarm Conditions** mapping configuration is accessed from the HART device properties dialog. Selecting the **Configure** button displays the **Alarm Condition** dialog that contains three tabs: **Status, Device** and **Subsystem.** All HART devices support the standard **Status** conditions, and this dialog allows you to reassign the conditions to different PlantWeb Alerts. By selecting **None**, a condition can be disabled from setting any PlantWeb Alert for that device, which could be useful in removing a chattering condition for filling up the Event Chronicle. Notice that any single condition can be mapped only to a single alert.
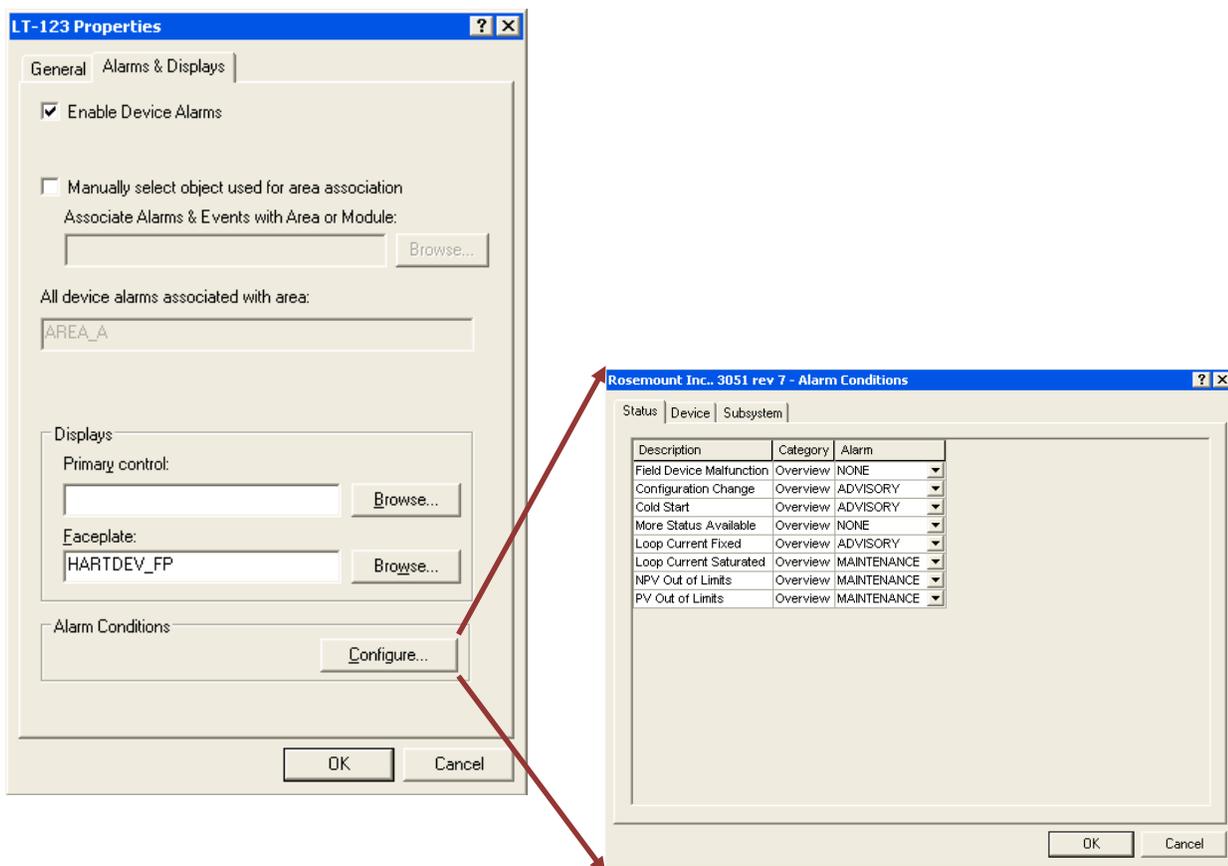

Figure 9 Configuring Alarm Conditions—Status

In addition to the standard HART status information, displayed under the **Status** tab, many HART devices have additional internal diagnostics called device-specific parameters. Emerson device manufactures have defined the significance of device conditions and mapped them to PlantWeb Alerts. This mapping is documented in the device EDDL files used by the AMS Device Manager and is imported into the DeltaV system as part of the device library so that the same PlantWeb Alerts can proactively alert the operations and maintenance personnel.

For those defined with device-specific information, the **Device** tab displays a list of conditions. These are both categorized from a device-function perspective and mapped to PlantWeb Alerts, based on their impact to the device. If the device does not support the device-specific conditions, this tab is blank.
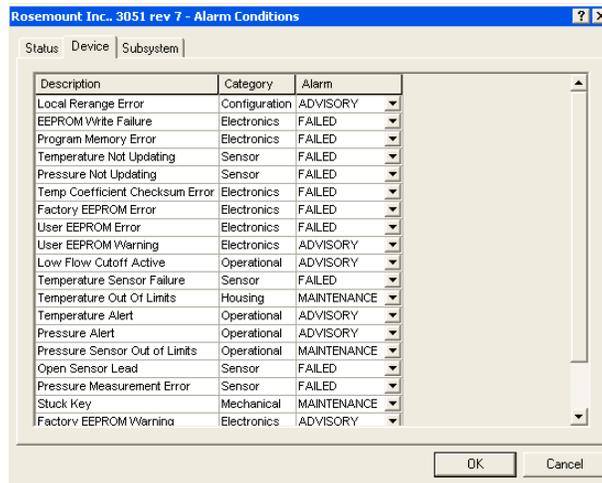

Figure 10 Configuring Alarm Conditions—Device

The DeltaV system uses Command 48 to retrieve the device-specific conditions by polling the device periodically. This allows the DeltaV system to support HART 5, 6 and 7 devices with PlantWeb Alerts. AMS Device Manager also issues the same Command 48 to read the device-specific data from a HART device. If the AMS Device Manager screen for a HART device shows PlantWeb Alert information, but the DeltaV system does not, it is likely a new device definition must be imported into the DeltaV system. Check with the device manufacturer to see if there is a later version that supports device-specific diagnostic conditions.
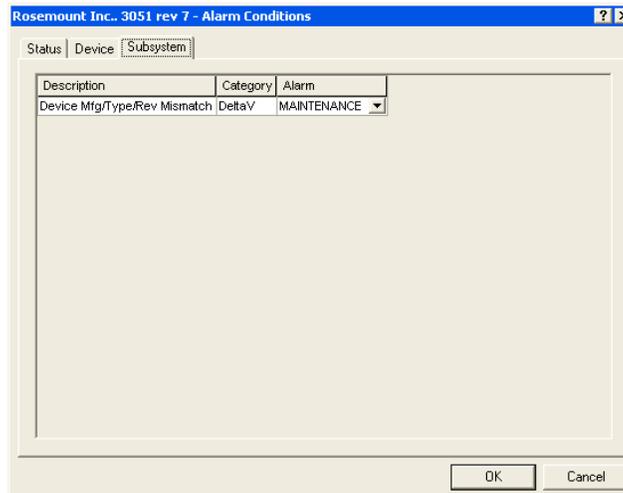

Figure 11 Configuring Alarm Conditions—Subsystem

The **Subsystem** tab provides additional alert conditions derived by the DeltaV system. All HART devices are verified for the correct device version to ensure that the correct device mappings are in use. A mismatch in a field device version could result in incorrect condition mappings.

PlantWeb Services

Emerson's offers PlantWeb Services with a structured approach to developing a predictive alert strategy. This approach provides configuration of credible alerts which has relevance to operational significance and directs the predictive alert information flow to the right users and applications. It also provides documentation and the necessary training plan to realize changes into work practices and capture results
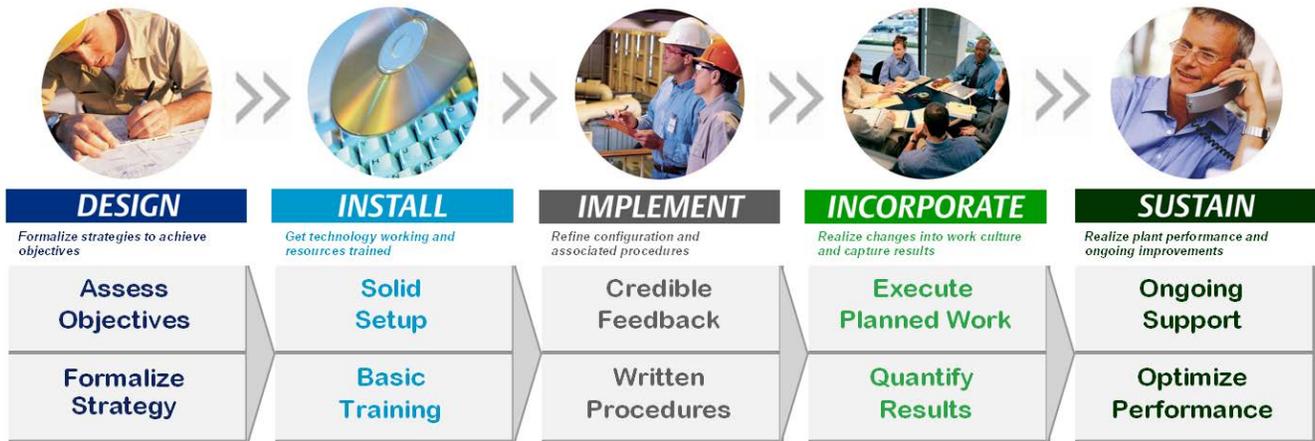

Figure 12 Structured Approach for Implementing PlantWeb Alerts

The typical activities associated with Emerson's structure approach provide the following:

■ **DESIGN –** Formalizes strategies to achieve objectives. Emerson service specialists assess the existing alert configuration and evaluate it for improvement opportunities. The assessment report includes findings and recommendations, so the right resources get information for action.

■ **INSTALL –** Get technology working and resources trained. Hardware and software components necessary for a solid setup to meet objectives are installed, and basic training is provided.

■ **IMPLEMENT –** Refine configuration and associated procedures. Emerson specialists configure PlantWeb Alerts reflecting operational significance and generate associated documentation to endorse adoption and comply with ISO 9000.

■ **INCORPORATE –** Realize changes into work culture and capture results. Emerson service specialists help integrate PlantWeb technology into work culture, align business systems, and compute financial impact after six months.

■ **SUSTAIN –** Realize plant performance and ongoing improvements. Ongoing support sustains performance and optimization through alarm and loop management.

Summary

Out of the box, the DeltaV system provides a comprehensive device alert reporting system suitable for most control system applications. On-board diagnostics in HART and FOUNDATION fieldbus devices provide the basis for detecting and preempting device conditions that, if left unchecked, could lead to an abnormal process condition.

Fieldbus devices internally generate alerts based on device conditions and report them to the DeltaV system for annunciation and logging. HART devices generate alert conditions and rely on the host system to read them. DeltaV systems V8.4 and later poll HART devices to create the PlantWeb Alerts that proactively alert operators and/or maintenance technicians.

The DeltaV system incorporates device PlantWeb Alerts into the overall alarm management system with the ability to fine-tune annunciation based on assignment of alarm priority, plant area, and workstation alarm banner thresholds. Device plant area assignment automatically follows the control modules where they are assigned.

The DeltaV system provides advanced users with optional advanced settings to tune each device's alerts according to their own plant alarm philosophy and practical needs. While many users will find the default DeltaV out-of-the-box settings adequate for a complete PlantWeb Alert implementation, advanced users can easily implement unique alarm management strategies such as:

■ Creating custom DeltaV alarm priorities specifically for device alerts and hardware alerts

■ Creating custom plant areas specifically for manual device alert and hardware alert assignment

■ Creating custom device templates with pre-set PlantWeb Alert priority settings for each type device, including device condition to alert level mapping for HART devices

■ Tuning the alarm banner thresholds of individual workstations with the **UserSettings.grf** file

Many Emerson devices now offer PlantWeb Alerts. Emerson is making a significant investment to enhance alert reporting capability for both new and existing field device types. As the number and sophistication of the alerts increase, there is an increased need to understand what each device type is capable of, and which of these alerts are appropriate for a particular installation. It is also important to keep documentation on the alerts used/not used for each device and the reasons. That way, when device configurations are reviewed in the future there is good information for accomplishing consistent and effective device setup.

PlantWeb Alerts should be introduced methodically to a DeltaV system, to avoid inappropriate notifications to operators who either have no action to take when alerted or have not been trained to respond. When properly deployed, PlantWeb Alerts can significantly improve system availability and reduce unscheduled outages.

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