



## **User Guide Part 9**

# **Alarming**

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# 1 Overview

This document outlines the use and general purpose of Alarms and Alarming in Status Device Cloud. The Status Server is an OPC UA compliant alarm server. Alarms are notifications that become active when a property's value is not normal or crosses some preconfigured threshold. Clients can subscribe to these notifications, monitoring for abnormal conditions within their object model.

For a list of frequently used terms, definitions, and abbreviations, see Part 1 – Overview and Concepts.

## 1.1 Types of Alarms

Deviation, Limit, Level and Rate of Change alarms have a <low low state>, <low state>, <high state> and <high high state>. These Alarms are exclusive with only one state being active at any one time. The Off Normal and Trip alarms are discrete and do not have low and high states. They are simply active or inactive.

**Alarm must have ALL states configured before they will work correctly.** (This is not true for the Off Normal and Trip Alarms as they can only be active or inactive and do not actually have states)

### 1.1.1 Deviation Alarm

A Deviation Alarm is often used to report an excess deviation between the desired value of a property and an actual measurement of the property. When configuring a deviation alarm, the normal value expected for a property is provided. The alarm becomes active when the deviation from the normal value exceeds normal expected deviation.

For example, if a property had a normal value of 10 and the high deviation Alarm limit was set for 2 and the low deviation Alarm limit had a value of -1 then the low state is active if the property value dropped to below 9; the high state is active if the process value became larger than 12. If the normal value was changed to 11 then the new deviation values would be 10 and 13 respectively.

### 1.1.2 Level Alarm

A Level Alarm is often used with instruments and is used to report when a limit is exceeded. The alarm becomes active when the observed value is above a high limit, or below a low limit. No normal value is defined; normal operating range is between the values configured for the low and high state.

### 1.1.3 Limit Alarm

The Limit Alarm is the same as Level Alarm, except the normal operating range is below low low, not between low and high. This allows for alarm escalation between all four levels.

### 1.1.4 Rate of Change Alarm

The Rate of Change Alarm is identical to a Level Alarm. It is intended to be used with properties that are measuring some rate of change like the rate that a tank is filled. The alarm activates if the rate of change is above or below the configured values. It has been defined primarily for categorization.

### 1.1.5 Off Normal Alarm

The Off Normal Alarm is a discrete alarm that becomes active if a property changes from its default value.

### 1.1.6 Trip Alarm

The Trip Alarm is identical to the Off Normal Alarm. It has been defined primarily for categorization and is normally used to indicate an equipment fault.

### 1.1.7 Quality Alarm

The Quality Alarm is the same as an Off Normal alarm with the exception that it works based off of the quality of the value that it is being set for. This alarm will trigger when the quality is bad.

## 1.2 Configuring Alarms

Alarms are configured for a given property in the Data Model Designer. Configuration options include setting the Alarm Type, the values for each state of escalation (if appropriate), whether or not the Alarm must be acknowledged, among others. The configuration established in the Data Model Designer will determine the behavior of your Alarm in runtime. For more detailed information on alarm configuration in the data model, refer to Part 2 – Data Model Designer.

### 1.2.1 Alarm Schedule

Alarms in Status Device Cloud now have the ability to be scheduled. This means that users can assign a time span in which Alarms may become active. Once the time span is configured, only Alarms that trigger within the threshold will become active. Any Alarms that trigger outside of the threshold will be discarded.

### 1.2.2 Syncing Alarms

Status Device Cloud provides an option to sync newly created alarms and property changes of existing alarms made in the Type Level to existing Assets. This saves users time and effort from performing an otherwise tedious task.

### 1.2.3 Grouping Alarms

Users will be able to organize alarms in groups. This is done by assigning a group to an existing alarm. Once this is configured, alarms can be easily filtered in groups when viewing alarms.

### 1.2.4 Alarm Default Document

Alarms can be configured to have a default document. This means that a mimic can be assigned directly to an Alarm. Users will be able to assign an Alarm Default Document in the Type level and the Asset level.

## 1.3 Logging Alarms

Alarm data is logged in much the same way as other data in Status Device Cloud. State changes, acknowledgements, and comments made on the alarm will be saved to the Data Logging Database. Some historical information for each alarm is also available through the Alarming Control in runtime. See Section 5 for more information on the Alarming Control.

## 2 Viewing Alarms

### 2.1 Model Browser

Alarms configured for a given property can be viewed within the Data Model Browser without any special configuration.

The screenshot displays the 'Alarming - water tank1' window. At the top, there are navigation icons and a search bar. Below that is a toolbar with buttons for 'Comment', 'Select Group', 'Refresh', 'Clear', 'Acknowledge All', 'Acknowledge', and 'Add Comment'. The main area contains a table of active alarms:

Alarm	Event Time	Active Time	State	Acknowledged	Message	User	Group
Temperature Limit Alarm	12/4/2015 4:00:02 PM	12/4/2015 10:13:20 AM	High	False	water tank:temperature - Temperature Limit Alarm is High Value = 80	Administrator	Alarm Group 2
Fill Level Alarm	12/4/2015 10:13:12 AM	12/4/2015 10:13:12 AM	High	False	water tank:fill level - Fill Level Alarm is High Value =		Alarm Group 1

Below the table, the selected alarm details are shown:

Property Name: water tank1 Alarm Name: Temperature Limit Alarm Limit Alarm temperature 80 Total: 2 Unacknowledged: 2

Time	Source	Value
12/4/2015 4:00:02 PM	Message	water tank:temperature - Temperature Limit Alarm is High Value = 80
12/4/2015 4:00:02 PM	State	High
12/4/2015 4:00:02 PM	Comment	
12/4/2015 4:00:02 PM	Acknowledged	False
12/4/2015 4:00:01 PM	Value	80

At the bottom, there is a 'Range Filter' section with a dropdown set to '1 Hours' and an 'Execute' button. A 'Show History' checkbox is also present and checked.

Figure 1 - Alarm in Data Model Browser

### 2.2 Runtime

To view alarms in a mimic in the Status Runtime, an Alarming Control will need to be added to the design surface and configured.

### 2.3 Gateway

Alarm Control can be viewed in the Web Gateway as read-only.

### 3 Alarm Control

The Alarm Control is located in the Toolbox of the Mimic Designer under the heading <Alarming>.

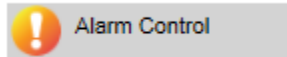


Figure 2 - Alarm Control Icon

Draw the Alarm Control out onto the design area as you would any other control in the toolbox.

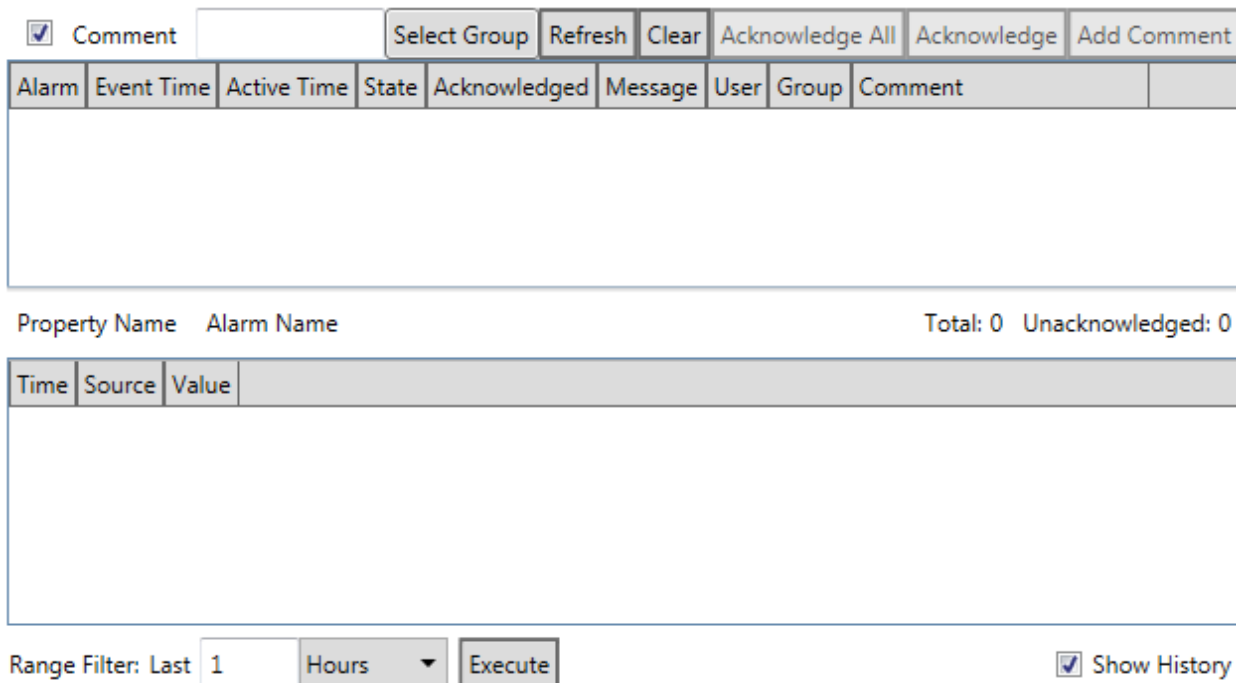


Figure 3 – Alarming Control

This is the visual interface through which you will view your alarming activity when the mimic is viewed in Runtime. To configure your Alarm Control, begin by selecting <Set Up> in the Properties tab.

#### 3.1 Configuring the Alarm Control

After selecting <Set Up> you will be presented with a <Configure Properties> dialog box.

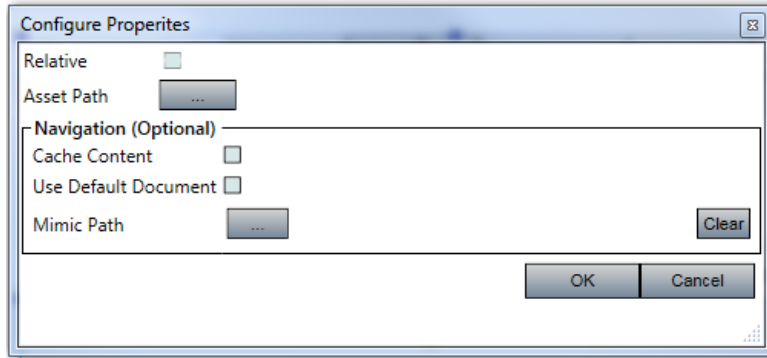


Figure 4 – Alarm Control Set Up

When you choose the Asset Path that will be used to configure your Alarm Control, you must decide whether it is a relative path or an absolute path by checking or un-checking the <Relative> checkbox. The Relative box is enabled by default when using a mimic template.

If you un-check the box and select the <Asset Path> button, you will be presented with your entire Asset Tree.

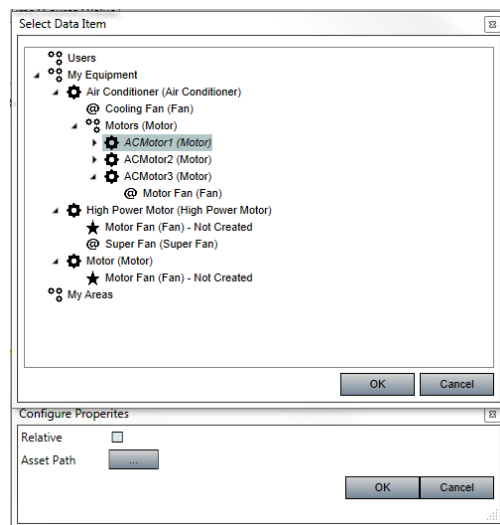


Figure 5 – Asset Path Selection

Select the Asset you would like to monitor with this Alarm Control. The <Select Data Item> dialog will close and you will see the path of your selected Asset displayed on the <Configure Properties> window. Select <OK> and the control will now be configured to display alarming information for each Alarm that has been assigned to any and all Properties of this particular Asset.

When setting up the Alarm Control, there is an optional setting for navigation. It can be configured to navigate to either a default document or a specific mimic.



**Navigation (Optional)**

Cache Content

Use Default Document

Mimic Path  Clear

Figure 6 - Alarm Control Navigation Setup

### 3.2 Alarming Control in Runtime

To view your active Alarm Control, you can select <Test Run> in the Mimic Designer, view your mimic in the Model Browser, or open your mimic with the Runtime Client. The control will display real-time information about the Properties the Alarm is monitoring.

Comment
Select Group
Refresh
Clear
Acknowledge All
Acknowledge
Add Comment
Navigate

Alarm	Event Time	Active Time	State	Acknowledged	Message
Temperature Limit Alarm	12/4/2015 4:00:01 PM	12/4/2015 10:13:20 AM	High	False	water tank:temperature Temperature Limit Alarm High Value = 80
Fill Level Alarm	12/4/2015 10:13:12 AM	12/4/2015 10:13:12 AM	High	False	water tank:fill level - Fill

Property Name Alarm Name
Total: 2 Unacknowledged: 2

Time	Source	Value

Range Filter: Last  Hours 
 Show History

Figure 7 – Alarm Control in Runtime

By default, active alarms will provide some basic information on the grid, including: the type of alarm (Alarm), the exact time of the event that caused the active state (Event Time), the time at which the Alarm became active (Active Time), the state of escalation (State), and the message that was configured at the time the Alarm was created in the Data Model Designer (Message).

Highlighting an Alarm on the grid will provide more detailed information about it.

Comment

Alarm	Event Time	Active Time	State	Acknowledged	Message
Temperature Limit Alarm	12/4/2015 4:00:01 PM	12/4/2015 10:13:20 AM	High	False	water tank:temperature Temperature Limit Alarm High Value = 80
Fill Level Alarm	12/4/2015 10:13:12 AM	12/4/2015 10:13:12 AM	High	False	water tank:fill level - Fill

Property Name **water tank1** Alarm Name **Temperature Limit Alarm Limit Alarm tempera** Total: 2 Unacknowledged: 2

Time	Source	Value
12/4/2015 4:00:02 PM	Message	water tank:temperature - Temperature Limit Alarm is High Value = 80
12/4/2015 4:00:02 PM	State	High
12/4/2015 4:00:02 PM	Comment	
12/4/2015 4:00:02 PM	Acknowledged	False
12/4/2015 4:00:01 PM	Value	80

Range Filter: Last     Show History

Figure 8 – Alarm Details

The detailed information will include the name of the Asset to which the Alarm is attached (Property Name) and the name of the Alarm itself. The Details Grid will also display the Alarm State, the associated message, and the exact value of the Property that tripped the Alarm.

The Alarming Control also provides an opportunity to add a comment to a particular Alarm activity on the grid; the comment will display alongside the name of the user who created it in the grid. If you do not want to see the Comment section on the Alarm control there is a checkbox called Comment that will allow you to Show/Hide it.

The Alarming Control also allows for user acknowledgement. If the Alarm was configured with the <Must Acknowledge> option selected, then the Alarm must be acknowledged by a user. Even if the Property to which the Alarm was assigned returns to a normal state, the Alarm will remain active until it has been acknowledged.

To use the navigation, simply select the alarm and press the Navigate button located on top.

Comment

Alarm	Event Time	Active Time	State	Acknowledged	Message
Temperature Limit Alarm	12/4/2015 10:21:32 AM	12/4/2015 10:13:20 AM	Low	True	water tank:tempera Temperature Limit Low Value = 75
Fill Level Alarm	12/4/2015 10:13:12 AM	12/4/2015 10:13:12 AM	High	False	water tank:fill level

Figure 9 - Alarm Control Navigation

Alarms can be sorted by groups. This is done by clicking the Select Group button and then, selecting the alarm group name. For more information about Alarm Grouping, please refer to User Guide Part 2 – Data Model Designer.

Alarm	Event Time	Active Time	State	Acknowledged	Message	User	Group	Comment
Temperature Limit Alarm	12/4/2015 10:25 10:13:20 AM		Low	True	water tank:tempera			Temperature Limit Low Value = 75
Fill Level Alarm	12/4/2015 10:13:12 AM	12/4/2015 10:13:12 AM	High	False	water tank:fill level			

Property Name **water tank1** Alarm Name **Temperature Limit Alarm Limit Alarm temj** Total: 2 Unacknowledged: 1

Figure 10 - Sort by Alarm Group

### 3.2.1 Acknowledging Alarms

Alarms can be acknowledged one at a time, or they can all be acknowledged simultaneously. Once an Alarm is acknowledged, the user who provided the acknowledgement will be displayed under the <User> heading on the grid, and any comment provided will be displayed under the <Comment> heading. If no comment was entered, a default comment of “Acknowledged” or “Acknowledge All” will populate the field.

Alarm	Event Time	Active Time	State	Acknowledged	Message	User	Group	Comment
Contamination	12/10/2015	12/10/2015 1	High	True	sil:contaminated - Trip Alarm is not Normal Value = True	Administrator	contamina	I've seen this
Temp Alarm	12/10/2015	12/10/2015 1	HighHigh	True	sil:temperature - Limit Alarm is HighHigh Value = 150	Administrator	temp grou	Acknowledged
Contamination	12/10/2015	12/10/2015 1	High	False	sil:contaminated - Trip Alarm is not Normal Value = True			
Temp Alarm	12/10/2015	12/10/2015 1	Low	False	sil:temperature - Limit Alarm is Low Value = 80	Administrator	temp grou	

Figure 11 - Acknowledged Alarms

After an Alarm is acknowledged, it will remain in an active state until the alarming condition has been resolved and the target Property has returned to a normal state. An Alarm that is in a normal state *and* has been acknowledged will automatically be removed from the grid.

The <Clear> button will clear the Alarm Control of active Alarms. The <Refresh> button will display the current Alarm conditions of all Alarms associated with the target Property. The <Add Comment> button will populate the <Comment> column of the grid with a comment the user has entered into the text field along the top of the Alarming Control.

### 3.2.2 Range Filter

The Alarm Control also provides an option for viewing historical information from a particular Alarm. The information will include a time stamp for each entry, and can include the recorded Values, States, Messages and Comments. To view this information, you will use the <Range Filter> option provided near the bottom of the Alarm Control. If you do not want to see the History section, there is a check box called Show History that will allow you to Show/Hide it.

Time	Source	Value
8/13/2013 9:01:09 PM	<a href="#">Comment</a>	<a href="#">Acknowledge</a>
8/13/2013 8:26:14 PM	<a href="#">Message</a>	<a href="#">Temperature i</a>
8/13/2013 8:26:14 PM	<a href="#">State</a>	<a href="#">HighH</a>

Range Filter: Last

Figure 12 – Range Filter

To use this option, simply highlight the Alarm for which you would like to view the history. You can choose how far back you would like to view by entering the appropriate information in the text field and drop down menu provided. The menu options include Seconds, Minutes, Hours, and Days. When you have entered your desired range, select the <Execute> button. The Lower Grid of the Alarm Control will display all available information for the time range specified.

### 3.3 Alarming Control in Gateway

A read-only version of the Alarm Control with navigation is supported in the gateway.

						Select Group	Navigate
Alarm	Event Time	Active Time	State	Acknowledged	Message		
Contamination Alarm	12/10/2015, 11:05:10 AM	12/10/2015, 11:05:10 AM	High	False	sil:contaminated - Trip Alarm is no		
Temp Alarm	12/10/2015, 1:23:02 PM	12/10/2015, 11:05:43 AM	Low	False	sil:temperature - Limit Alarm is Lo		
Fill Alarm	12/10/2015, 1:22:49 PM	12/10/2015, 11:05:33 AM	HighHigh	False	Fill Level is HighHigh Value = 200		
Contamination Alarm	12/10/2015, 1:26:06 PM	12/10/2015, 11:26:32 AM	High	True	sil:contaminated - Trip Alarm is no		
Temp Alarm	12/10/2015, 1:18:20 PM	12/10/2015, 11:26:59 AM	HighHigh	True	sil:temperature - Limit Alarm is Hi		

Figure 13 - Read Only Alarm Control

## 4 Historical Alarm Control

The Historical Alarm Control is used to display historical information of the alarms in your entire model. It is located in the Toolbox of the Mimic Designer under the heading <Alarming>.

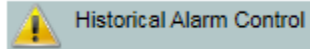


Figure 14 - Historical Alarm Control Icon

Unlike the Alarm Control, the Historical Alarm Control doesn't require any setup. Just draw out the Alarm Control out onto the design area, save the mimic and access in the Runtime or Gateway.

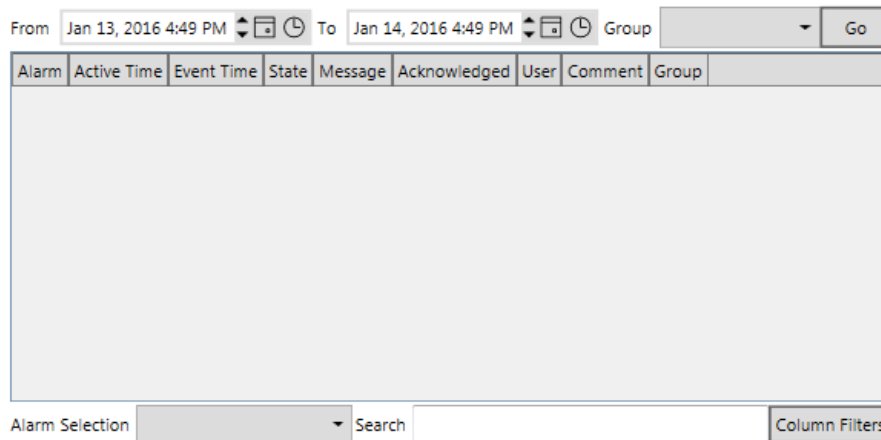


Figure 15 - Historical Alarm Control

### 4.1 Using Historical Alarm Control

To begin, specify the date and time range using the From and To boxes. At this point, just click Go to start getting historical information.



Figure 16 - Date and Time Range

Historical Alarm Control can also filter historical information by alarm group. Once the date range has been entered, select a group from the list before clicking Go.

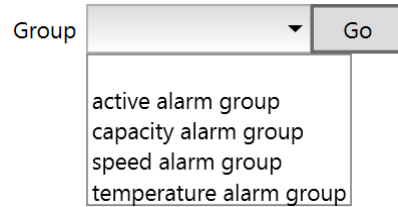


Figure 17 - Alarm Group List

The data grid of the Historical Alarm contains the name of the alarm (Alarm), the time at which the Alarm became active (Active Time), the exact time of the event that caused the active state (Event Time), the state of escalation (State), the message that was configured at the time the Alarm was created in the Data Model Designer (Message), if the alarm has been acknowledged (Acknowledged), the user who left a comment (User) and the actual comment from that User (Comment).

From Jan 14, 2016 11:22 AM To Jan 15, 2016 11:22 AM Group [dropdown] Go

Alarm	Active Time	Event Time	State	Message
Trip Alarm	1/14/2016 11:16:31 AM	1/14/2016 4:03:45 PM	Normal	water tank:active - Trip Al
Fill Limit	1/14/2016 4:04:07 PM	1/14/2016 4:04:07 PM	Low	water tank:fill level - Fill Li
Fill Limit	1/14/2016 4:04:07 PM	1/14/2016 4:04:16 PM	LowLow	water tank:fill level - Fill Li
Temperature Alarm	1/14/2016 4:04:22 PM	1/14/2016 4:04:22 PM	LowLow	water tank:temperature -
Temperature Alarm	1/14/2016 4:05:09 PM	1/14/2016 4:05:09 PM	Normal	water tank:temperature -
Temperature Alarm	1/14/2016 4:05:09 PM	1/14/2016 4:05:09 PM	High	water tank:temperature -
Temperature Alarm	1/14/2016 4:05:09 PM	1/14/2016 4:05:32 PM	HighHigh	water tank:temperature -
Temperature Alarm	1/14/2016 4:05:09 PM	1/14/2016 4:05:43 PM	LowLow	water tank:temperature -
Temperature Alarm	1/14/2016 4:05:09 PM	1/14/2016 4:07:10 PM	HighHigh	water tank:temperature -
Temperature Alarm	1/14/2016 4:05:09 PM	1/14/2016 4:09:26 PM	LowLow	water tank:temperature -
Fill Limit	1/14/2016 4:04:07 PM	1/14/2016 4:10:37 PM	High	water tank:fill level - Fill Li
Trip Alarm	1/14/2016 4:13:54 PM	1/14/2016 4:13:54 PM	High	water tank:active - Trip Al
Trip Alarm	1/14/2016 4:13:54 PM	1/14/2016 4:15:02 PM	Normal	water tank:active - Trip Al

Alarm Selection [dropdown] Search [input] Column Filters [button]

Figure 18 - Alarm Historical Control Grid

The data grid can be filtered by the specific alarm. Click the Alarm Selection list and then select the alarm.

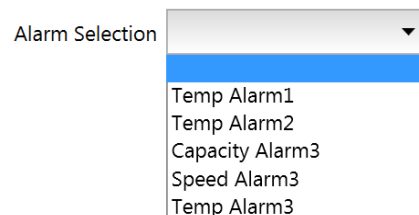


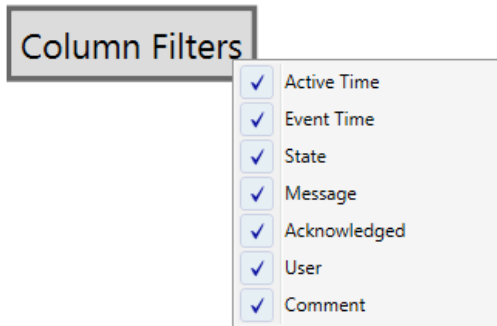
Figure 19 - Alarm Selection

The Search box also allows filtering the data grid based on the words entered for search.



Figure 20 - Search Box

Columns in the Historical Alarm Control can be disabled and enabled using the Column Filters.



*Figure 21 - Column Filters*

The Historical Alarm Control is supported on both Runtime and Gateway.

## 5 Additional Information and Support

For more information in using Status Device Cloud, please visit us at [www.scadauniversity.com](http://www.scadauniversity.com). This will give you access to instructional videos, documentation and our online forum. You can also email B-Scada support at [support@b-scada.com](mailto:support@b-scada.com).



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