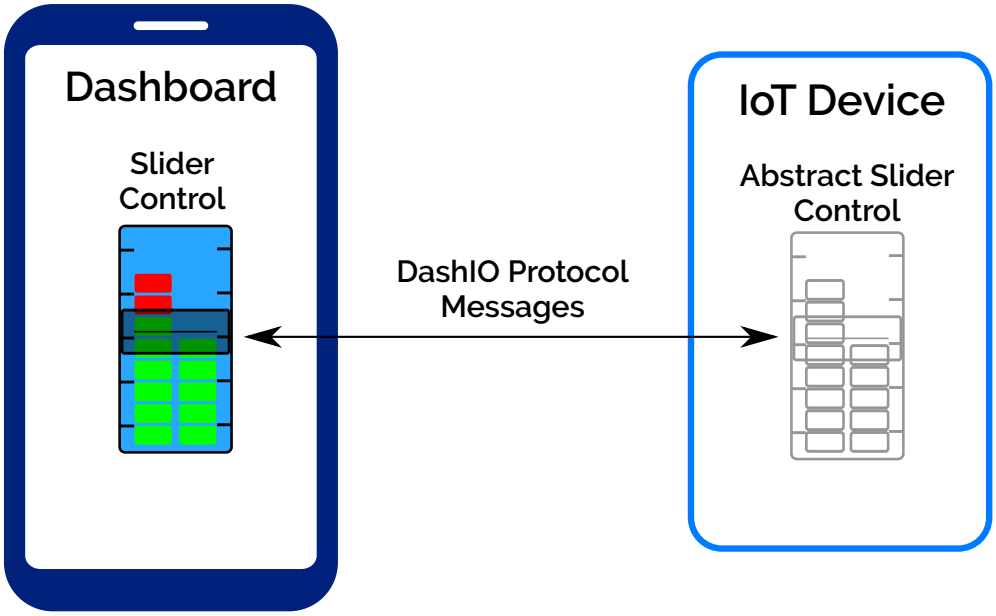
Dash IoT Dashboard App Controls

Revision Date: 31 October 2024

The **Dash** app enables user configurable **controls** to be placed on **Device Views** on the app. The controls model the behaviour of the IoT device. Each control is able to display information received from the IoT device or to send control information to the IoT device.

Messages are used to send and receive data between **controls** on the **Dash** app and a corresponding **abstract controls** within the IoT device, as shown in the figure below that illustrates a slider control:



1. Device View

Each **control** belongs to, and is displayed on, a **Device View** on the **Dash** app. Each Device View belongs to an IoT device. Device Views are displayed on the **Dash** app in columns. The DeviceView's height has a maximum value of the screen height and width of one to three columns. The number of columns on the **Dash** app differs between phones and tablets as follows:

Phone

- Orientation: Portrait only
- One column

Tablet

- Orientation: Landscape only
- Three columns

A device view contains a number of user configurable **parameters** that combine into a **theme** for the device view. All controls on the device view are displayed according to the theme of the device view. The parameters of the device view are shown in the table below:

Parameter	**Purpose**
Device	Name of the device the device view belongs to
Control ID	Identifier of the device view. Only used during configuration for controls to identify the device view they belong to.
Name	Displayed at the top of the device view.
Icon	Used in the **Pages** menu at the bottom of the display.
Background Color	Color of the page background.
Grid Cell Columns	Number of columns in the snap grid when editing.
Grid Cell Rows	Number of rows in the snap grid when editing.
Snap To Grid	When a control is moved, its position and dimensions will snap to the nearest grid line.
Share Column	When enabled, allows more than one control view to be presented in a column, but only if they fit together in the column.
Number of Columns	Width of the control view, specified by the number of columns from 1 to 3.
Style	Select the general style of all the controls
Maximum Font Size	The maximum size of the font of the theme, excluding the title box.
Border & Title Color	Color of the border and the title text of the theme.
Control Color	Default color of text and graphics of the theme.
Background Color	Background color of the theme.
Background Transparency (%)	Transparency of the background color of the theme.
User "Tappable" Color	Color of items in controls that can be tapped by the user to perform a function (e.g. button on a Time Graph or a Menu control icon). If a valid colour is not specified, the control color will be used.
Title Font Size	Font size for the title text of the theme.

Parameter	Purpose
Title Box Color	Color of the title box background of the theme.
Title Box Transparency (%)	Transparency of the color of the title box of the theme.

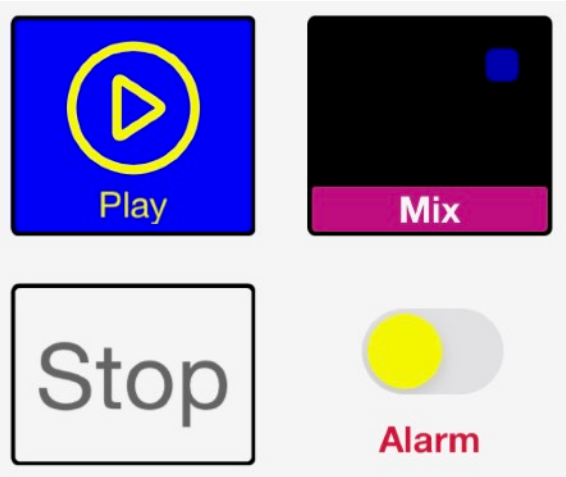
2. Control Common Parameters

All controls have parameters that define their position on the **Dash** app and other important information.

Parameter		**Purpose**
Coordinates	Horizontal Position	Position of the control on the display, where 0 is the left side and 1 is the right side.
	Vertical Position	Position of the control on the display, where 0 is the top and 1 is the bottom.
	Width	Width of the control from 0 to 1, where 1 is the width of the page.
	Height	Height of the control from 0 to 1, where 1 is the height of the page.
Control ID		Identifier of the control. Used by the **Dash** app and IoT Device to identify which control is being communicated with.
Title		Displayed in the title box of the control.
Title Position		Position of the title box: • **None** - the title box is not displayed. • **Top Left** - the title box is displayed at the top left of the control. • **Top** - the title box is displayed at the top of the control. • **Bottom** - the title box is displayed at the bottom of the control.

The coordinates of the control cannot be adjusted from within the control's parameter menu. They can only be changed by manually moving the control when the **Dash** app is in Edit Mode.

3. Button



A Button allow the user to send simple action messages, informing the IoT device that the button has been pressed. The button state (**on** or **off** color) is not changed by tapping the button. After the IoT device receives a message containing the action, it sends a message back to the control on the **Dash** app to set the button state.

A Button control behaves as both as a momentary push button for user input and as a status indicator to provide feedback from the IoT device.

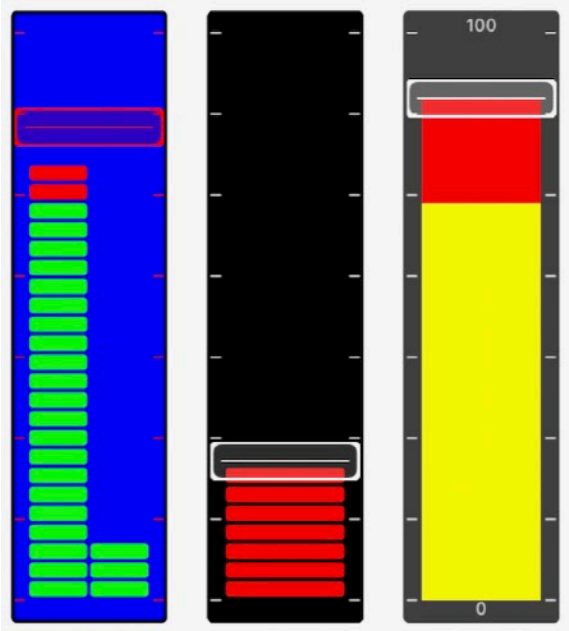
If the Button is continuously pressed by the user, the button message is repeatedly sent to the IoT device, every 0.4 seconds, until the button is released.

A Button receives messages from the IoT device to show the state of the button in the IoT device (either **off** or **on**) and the button text and icon may also be received in these messages. The IoT device may independently send a Button message to the **Dash** app at any time, to update the display on the button.

The Button specific parameters are as follows:

Parameter	**Purpose**
Button Enabled	Enable the button to send button press messages to the IoT Device. If the button is disabled, it will still receive and display button status messages, thus behaving as an indicator.
Presentation Style	Style of the Button control. May be “basic” for simple icon and text that is set to the on or off color or “highlight” to add a highlighted area behind the button which is set to the on or off color.
Default Icon	Icon shown on the button, but a **None** option may be selected if an icon is not to be displayed.
Default Button Text	Default text displayed on the button, but may be left empty if text is not to be displayed.
Button Off Color	Color of the text and icon when the button is in the **off** state.
Button On Color	Color of the text and icon when the button is in the **on** state.

4. Slider With Bar Graph



Sliders allow the user to send a numerical values to the IoT device when the user drags the slider to a new position. The slider also includes a single or double bar graph that can be set by the IoT device. The bar graphs can be controlled independently of the slider or can be used to provide feedback to the user from the IoT Device.

The slider may be disabled to allow the control to be a single single or double bar graph.

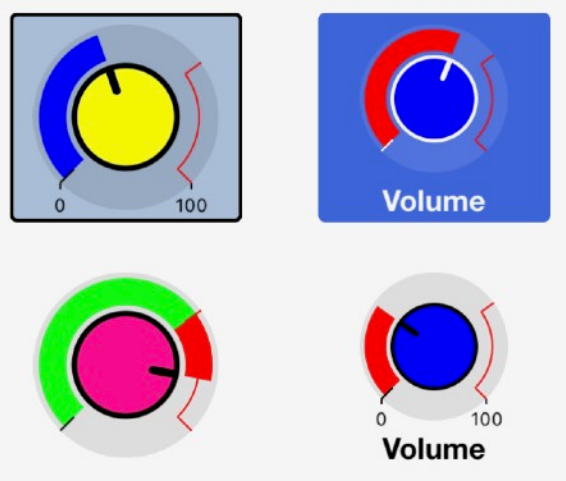
A Slider receives two types of messages from the IoT Device:
- Bar position messages set the position of the single or double bar graph behind the slider.
- Slider position messages set the position of the user adjustable slider. This allows the initial condition of the slider control in the **Dash** app to be setup by the IoT device.

The Slider specific parameters are as follows:

Parameter	**Purpose**
Minimum Value	Minimum value for the slider and bar graphs. All slider and bar graph messages must be scaled to this minimum value.
Maximum Value	Maximum value for the slider and bar graphs. All slider and bar graph messages must be scaled to this maximum value.
Red Zone Value	Bar graph values above the Red Zone Value will be colored red.
Show Min & Max Values	Show the minimum and maximum values on the slider control
Slider Enabled	Enable the slider knob and send slider position messages to the IoT Device. If the slider is disabled, it will still receive and display bar graph position messages, thus behaving solely as a bar graph.
Knob Color	Color of the slider knob.

Parameter	Purpose
Send Message Only On Release	When enabled the **Dash** app will send a single message to the IoT device when the user finishes moving the slider and releases their finger from the control. When disabled, the **Dash** app will continuously send messages to the IoT device as the slider is moved. This is not suitable for controlling devices over wide area networks, but typically works well with Bluetooth light (BLE). For MQTT connections, messages are only send when the user finishes moving the slider.
DEPRECATED (Use Bar Mode) ~~Bar Follows Slider~~	~~The bar graph value is set to be the same as the slider value and does not respond the bar graph position messages from the IoT device.~~
Bar Mode	Bar Behaviour: • **Follow Slider** - bar value is set to be the same as the slider value. • **Messages** - bar position responds to bar specific messages from the IoT device.
Bar Color	Color of the bar graph.
Bar Style	Style of the bar: • **Solid** • **Segmented**

5. Knob With Dial Display



A Knob allow the user to send numerical values to the IoT device when the user drags the knob to a new position. A Knob control contains a user adjustable knob surrounded by a simple dial indicator. The dial can be controlled independently of the knob or can be used to provide feedback to the user from the IoT Device.

A Knob control sends knob position messages to the IoT device.

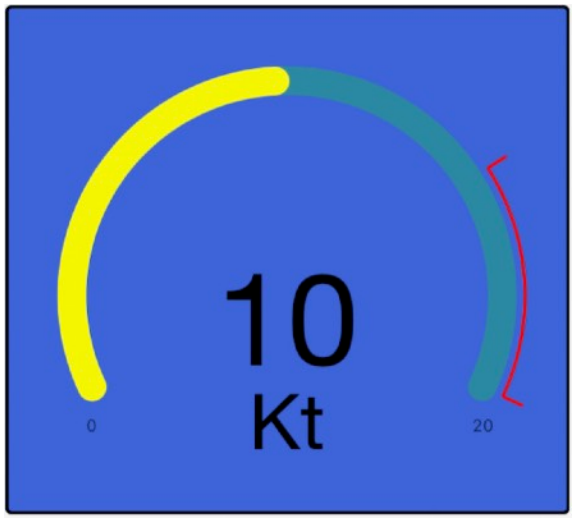
A knob receives two types of messages from the IoT Device:
1) Dial position messages set the position of the dial.
2) Knob position messages set the position of the user adjustable knob. This allows the initial condition of the knob control in the **Dash** app to be setup by the IoT device.

The Knob specific parameters are as follows:

Parameter	Purpose
Minimum Value	Minimum value for the knob and dial. All knob and dial messages must be scaled to this minimum value.
Maximum Value	Maximum value for the knob and dial. All knob and dial messages must be scaled to this maximum value.
Red Zone Value	Dial values above the Red Zone Value will be colored red.
Presentation Style	Style of the dial: • **Normal** - dial draws from left to right. • **Pan** - dial draws from center to left or center to right.
Show Min & Max Values	Show the minimum and maximum values on the knob control.
Knob Color	Color of the knob.

Parameter	Purpose
Send Message Only On Release	When enabled the **Dash** app will send a single message to the IoT device when the user finishes moving the knob and releases their finger from the control. When disabled, the **Dash** app will continuously send messages to the IoT device as the knob is moved. This is not suitable for controlling devices over wide area networks, but typically works well with Bluetooth light (BLE). For MQTT connections, messages are only send when the user finishes moving the knob.
DEPCATED (Use Dial Mode) ~~Dial Follows Knob~~	~~The dial value is set to be the same as the knob value and does not respond the dial position messages from the IoT device.~~
Dial Mode	Dial Behaviour: • **Follow Knob** - dial value is set to be the same as the knob value. • **Messages** - dial position responds to dial specific messages from the IoT device.
Dial Color	Color of the dial

6. Dial Display

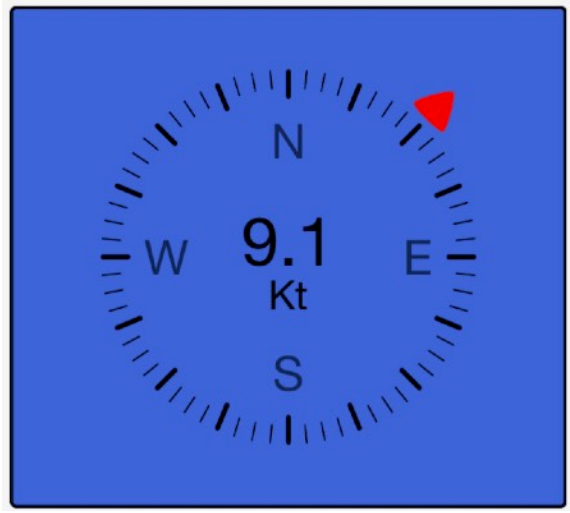


A Dial display is used to present a numerical value in a graphical circular dial. The Dial display receives messages from the IoT device to set the dial position.

The Dial display specific parameters are as follows:

Parameter	Purpose
Minimum Value	Minimum value for the dial. All dial messages must be scaled to this minimum value.
Maximum Value	Maximum value for the dial. All dial messages must be scaled to this maximum value.
Red Zone Value	Dial values above the Red Zone Value will be colored red.
Dial Fill Color	Color of the area behind the dial pointer.
Pointer Color	Color of the dial pointer.
Presentation Style	Style of the dial: • **Bar** - the dial rotates clockwise from left to right in a **bar** style. • **Pie** - the dial rotates clockwise from left to right in a **pie** graph style. • **Pie Inverted** - the dial rotates clockwise from right to left a **pie** graph style.
Numeric Value Position	Position of the number equivalent to the dial position: • **Off** - the dial value is NOT displayed and the dial takes maximum space • **Left** - the dial value is shown on the left side of the dial • **Right** - the dial value is shown on the right side of the dial • **Centre** - the dial value is shown in the middle of the dial
Show Min & Max Values	Show the minimum and maximum values on the dial display.
Units Text	The Units Text are displayed after the value on the dial display.
Numeric Precision Override	When the Numeric Precision Override is set to **off**, the number will be display to the same precision that it is received as in the message data. Otherwise, the number is presented to the numeric precision override specified.

7. Direction Display

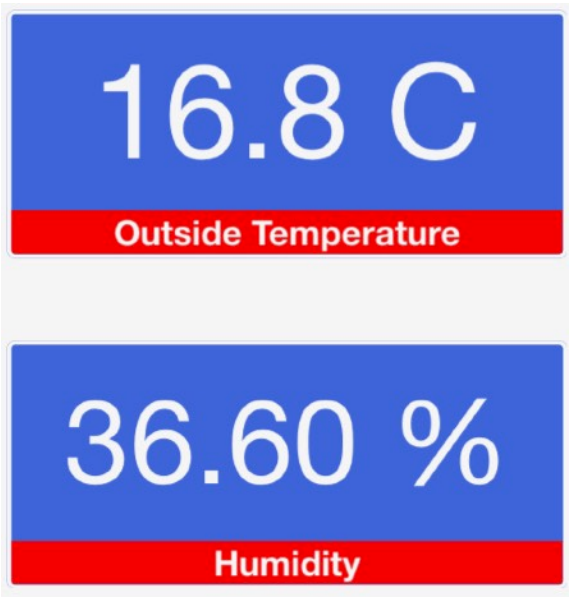


A Direction display is used to graphically present a decimal direction value from 0 to 360 degrees. The Direction display receives messages from the IoT device to set the direction indicator position.

The Direction display specific parameters are as follows:

Parameter	Purpose
Pointer Color	Color of the pointer
Presentation Style	Style of the dial: • **NSEW** - the direction rose is subdivided into North, South, East and West sectors. • **Deg** - the direction rose is presented in degrees. • **Port/Starboard** - the direction rose is in degrees to port and starboard of a sailing vessel.
Calibration Offset	Offset of the direction pointer in decimal degrees. May be used for calibration.
Units Text	The Units Text are displayed below the secondary value on the direction display.
Numeric Precision Override	When the Numeric Precision Override is set to **off**, the number will be display to the same precision that it is received as in the message data. Otherwise, the number is presented to the numeric precision override specified.

8. Text Box



A Text Box control receives simple line text messages from the IoT device to display on the **Dash** app. The text may optionally be plain text, reformatted as a number or, when the text is ISO8601 date/time, it may be formatted to a date/time that is easy to read.

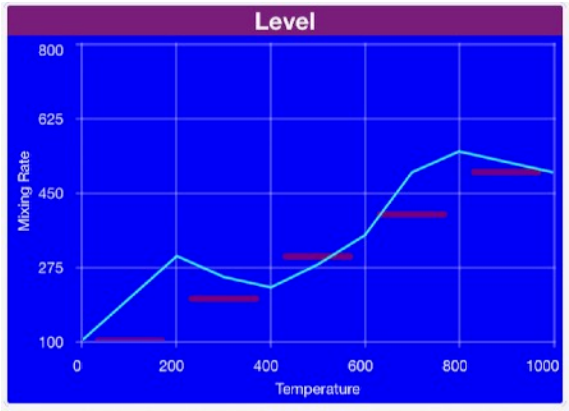
The Text Box may also allow the user to input text. Touching the control will present the user with a keyboard where the user can enter text. When the **Send** button on the keyboard is pressed, the message will be sent to the IoT device.

The Text Box specific parameters are as follows:

Parameter	Purpose
Format Type	Form applied by the text box to the displayed text: • **None** - no additional formatting is done • **Numeric** - the text is formatted as a number and the units and precision parameters are applied. • **Date/Time Short** - the message text must be an ISO8601 string and is formatted nicely according to the date time formatting selected by the user for the phone. • **Date/Time Long** - the message text must be an ISO8601 string and is formatted nicely according to the date time formatting selected by the user for the phone. The timezone is also shown. • **Interval** - the message text is must be ISO8601 string and is formatted nicely as "hh:mm:ss" with units and in 24hr mode. • **Log** - the unformatted messages are displayed in a multiline format to show the sequential messages. Duplicate messages are NOT displayed. The ISO8601 format is "yyyy-MM-dd'T'HH:mm:ssZZZ" for datetime, "yyyy-MM-dd" for date, and "HH:mm:ssZZZ" for time or interval.

Parameter	Purpose
Text Alignment	Alignment of the text displayed on the control: • **Left** - left adjusted • **Center** - center adjusted • **Right** - right adjusted
Units Text	When the Format Type is **Numeric**, the Units Text are displayed after the number on the display.
Numeric Precision Override	When the Format Type is **Numeric**, the number is displayed according to the Numeric Precision Override. When the Numeric Precision Override is set to **off**, the number will be display to the same precision that it is received as in the message data. Otherwise, the number is presented to the numeric precision override specified.
Caption Mode	Behaviour of captions displayed below primary text: • **Show Sent Value** - show the last value entered into the text box. The caption will be cleared once the same value is received from the IoT device. • **Messages** - caption displays text from specific messages from the IoT device.
Input/Keyboard Type	The type of keyboard that is used for user input: • **None** - no keyboard, therefore no user ability to enter and send text to the IoT Device. • **All Characters** - full keyboard with all characters. • **Numeric** - numeric keyboard, including the decimal point. • **Integer** - numeric keyboard WITHOUT the decimal point (i.e. for integers). • **Date** - date selector. • **Time** - time selector. • **Date & Time** - date and time selectors. • **Interval** - interval selector for hours, minutes and seconds. • **Hexadecimal** - hexadecimal keyboard.
Close Keyboard On Send	Close the keyboard once the send button has been pressed.

9. Chart Display



A Chart display is used to present graphical data on the **Dash** app, where the data is a series of vertical (Y) axis data. The data is evenly spaced on the horizontal (X) axis. The IoT device sends a message for each line in the chart. The data may be shown as lines, bars or peak values. Each line can be independently added, deleted or changed by the IoT device.

The line message information from the IoT device includes the line **identifier**, **name**, **type** (line, bar etc.), **color** and **data points** for the the line. The Chart display draws each line when a new message is received. If a new line is received by the **Dash** app and the line identifier has already been used, the line is replaced by the new line.

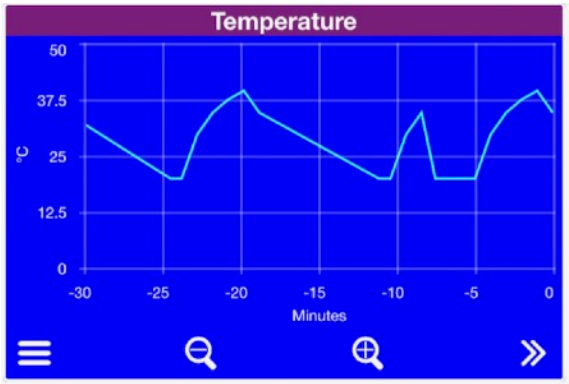
The Chart display specific parameters are as follows:

Parameter	Purpose
X Axis Label	Label on the chart horizontal (X) axis. May be left empty.
X Axis Minimum	Label to indicate the horizontal axis minimum value.
X Axis Maximum	Label to indicate the horizontal axis maximum value.
X Axis Number Of Lines	Number of vertical lines on the chart display, including the left and right sides of the chart.
X Axis Labels Position	Position of the labels on the horizontal axis: • **On Lines** - best for line charts. • **Between Lines** - best for bar chart.
Y Axis Label	Label on the chart left side vertical (Y) axis. May be left empty.
Y Axis Minimum	Minimum value for the left side vertical (Y) axis. All chart line message data must be scaled to this minimum value.
Y Axis Maximum	Maximum value for the left side vertical (Y) axis. All chart line message data must be scaled to this maximum value.
Y Axis Number Of Lines	Number of horizontal lines on the chart display, including the top and bottom of the chart.
Y Axis Label Right	Label on the chart right side vertical (Y) axis. May be left empty.
Y Axis Min Right	Minimum value for the right side vertical (Y) axis. All chart line message data must be scaled to this minimum value.
Y Axis Max Right	Maximum value for the right side vertical (Y) axis. All chart line message data must be scaled to this maximum value.

Parameter	Purpose
Position of Chart Key	Position of the chart key: • **Top Left** - top left side of the chart • **Top Right** - top right side of the chart

Notes:
- When the user taps the chart key, a menu of chart adjustment options is presented to the user.
- When the user taps the chart, but not the chart key, the chart key visibility is toggled.

10. Time Graph Display



A Time Graph display is used to present time-series data on the **Dash** app, where the data is a series of points containing the time on the horizontal (X) axis and values on the vertical (Y) axis. The IoT device sends messages for each line in the graph. Each message contains one or more data points and the **Dash** app appends the incoming data to create a data series that can be presented, panned and zoomed by the user. The data may be shown as lines, bars or blocked areas. Each line can be independently added, deleted or changed by the IoT device.

Multiple IoT devices may be assigned to a single Time Graph display.

The line data must be stored so that it can be downloaded to the **Dash** app each time the **Dash** app is used. You may store the line data in the IoT device, or alternatively, the **dash** cloud can store the data for you to remove the burden from your IoT device. When required, the **Dash** app sends messages to the **Dash** cloud server and IoT device requesting an update of the graph line information from after the last data point stored. This allow the **Dash** app to update its graph lines after the **Dash** app has been closed down for a period of time and restarted. If you are storing the data on the Dash cloud, your IoT device can ignore graph line update request messages from the **Dash** app.

The line message information from the IoT device or **Dash** cloud includes the line **identifier**, **name**, **type** (line, bar etc.), **color** and **data points** for the the line. The Time Graph display updates and redraws each line when a new message received.

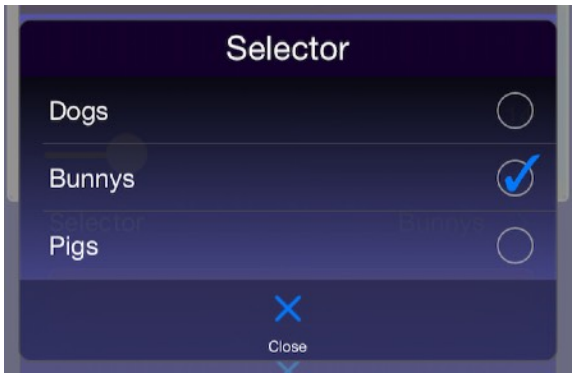
The Time Graph display specific parameters are as follows:

Parameter	Purpose
Graph Lines	Menu that enables editing of the graph lines
Y Axis Label	Label on the graph left side vertical (Y) axis. May be left empty.
Y Axis Minimum	Minimum value for the left side vertical (Y) axis. All graph line message data must be scaled to this minimum value.
Y Axis Maximum	Maximum value for the left side vertical (Y) axis. All graph line message data must be scaled to this maximum value.
Y Axis Number Of Lines	Number of horizontal lines on the graph display, including the top and bottom of the graph.
Y Axis Label Right	Label on the graph right side vertical (Y) axis. May be left empty.
Y Axis Min Right	Minimum value for the right side vertical (Y) axis. All graph line message data must be scaled to this minimum value.

Parameter	Purpose
Y Axis Max Right	Maximum value for the right side vertical (Y) axis. All graph line message data must be scaled to this maximum value.
Show Device Name In Key	Include the name of the IoT Device in the key of the graph lines.
Position of Graph Key	Position of the graph key: • **Top Left** - top left side of the graph • **Top Right** - top right side of the graph

Notes:
- When the user taps the graph key, a menu of graph adjustment options is presented to the user.
- When the user taps the graph, but not the graph key, the graph key visibility is toggled.

11. Selector



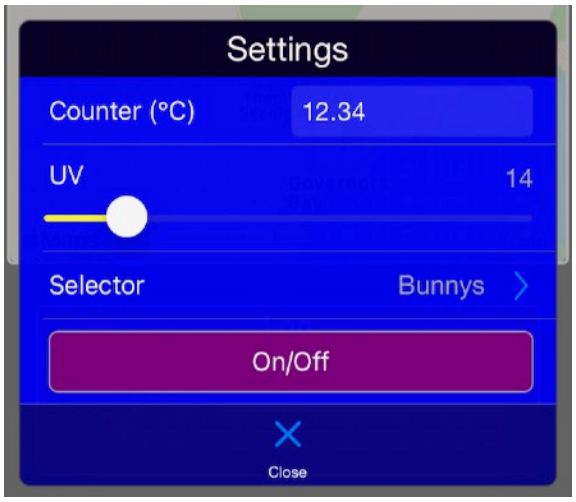
A Selector control is used to present a popup list of options that the user can select from. When a Selector is tapped, the **Dash** app presents the list of text options to the user to make their selection from. The user can tap on an option to select is and the index of the selected option will be sent to the IoT device.

Feedback to the user of the **Dash** app is achieved when the IoT device responds to the selection message. The app updates the Selector control check box with this value.

The selector options are obtained from a message from the IoT Device which contains a list of the text items to present. The IoT Device may send the the selector options at any time and can there change the contents of the selector when required.

The Selector control does not have any Selector specific parameters.

12. Menu



A Menu control is used to present a popup table of user adjustable controls and is ideal for presenting a list of IoT device setup parameters. The Menu does not receive messages directly, but presents a list of other controls (sub-controls) that send and receive messages of their own.

When the Menu is tapped, it sends a message to the IoT device requesting an update of the values of the controls that are in the Menu. However, the IoT Device is not required to reply to the update request and the sub-controls can be updated by the IoT device at any time.

The control types that my be used in a menu are: **Button**, **Selector**, **Text Box** and **Slider**.

The order of the menu items is defined by lexical sorting on the **device_ID** of the controls within the Menu, ascending order of numbers before uppercase characters before lowercase characters.

Within the **Dash** app, Menu controls can be created and added into the Provisioning menu. This can be done when the **Device View** is in Edit Mode.

The Menu control specific parameters are as follows:

Parameter	**Purpose**
Presentation Style	Style of the Menu control. May be “basic” for simple icon and text or “highlight” to add an encircling border.
Icon	Icon shown on the menu, but a **None** option may be selected if an icon is not to be displayed.
Menu Text	Text displayed on the menu, but may be left empty if text is not to be displayed.
Sub-controls	Menu that enables the sub-controls of the menu to be edited.

13. Button Group

A Button Group control is used to present a popup grid or table of Button controls. The Button Group does not receive messages directly, but presents Button controls that send and receive messages.

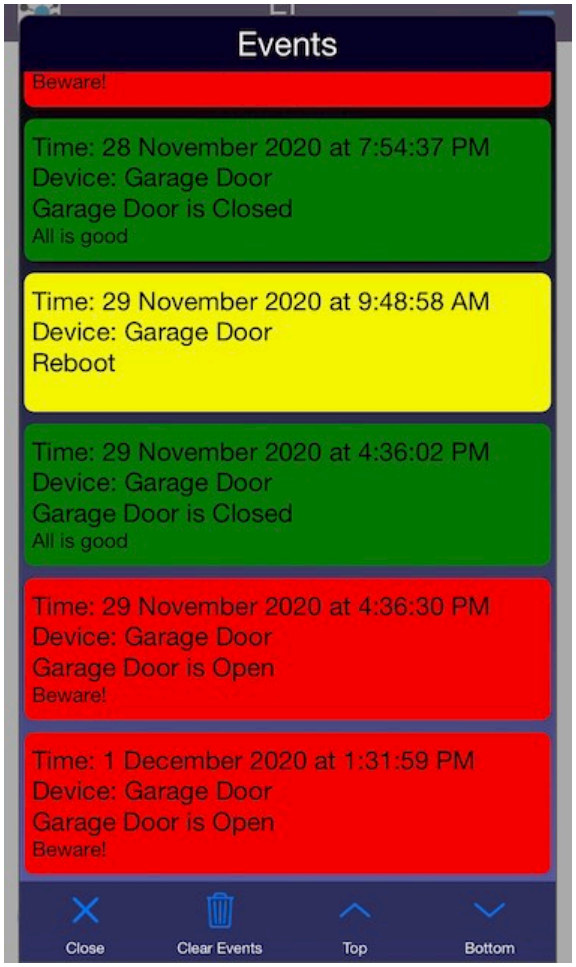
When the **Button Group** is tapped, it sends a message to IoT device requesting an update of the status of the Buttons that are in the Button Group. However, the IoT Device is not required to reply to the update request and the sub-control buttons can be updated by the IoT device at any time.

The order of the Button Group items is defined by lexical sorting on the **device_ID** of the buttons within the Button Group, ascending order of numbers before uppercase characters before lowercase characters.

The Button Group control specific parameters are as follows:

Parameter	Purpose
Presentation Style	Style of the Button Group control. May be “basic” for simple icon and text or “highlight” to add an encircling border.
Icon	Icon shown on the button group, but a **None** option may be selected if an icon is not to be displayed.
Button Group Text	Text displayed on the button group, but may be left empty if text is not to be displayed.
Grid View	When enabled, the buttons in a grid format. When NOT enabled, the buttons will be displayed in a vertical list
Buttons	Menu that enables editing of the button controls of the button group.

14. Event Log Display



An Event Log display is used to present time stamped events or alarms from and IoT device. The most recent even is shown on the control on the page and a scrollable list of events is presented when the Event Log is tapped by the user.

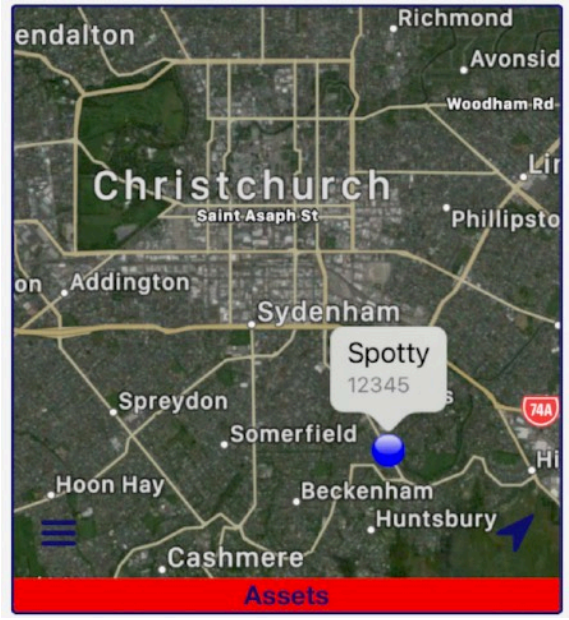
Each event contains the time of the event, the color to display the event and the text to display.

The event data is stored in the mobile device so that is does not need to be downloaded each time the **Dash** app is used. When required, the **Dash** app send a message to the IoT device requesting that the IoT device provide all event date from after the last event stored. This allow the **Dash** app to update its Event Logs after the app has been closed down for a period of time.

The event data must be stored so that it can be downloaded to the **Dash** app each time the **Dash** app is used. You may store the event data in the IoT device, or alternatively, the **dash** cloud can store the data for you to remove the burden from your IoT device. When required, the **Dash** app sends messages to the **Dash** cloud server and IoT device requesting an update of the event information from after the last event stored. This allow the **Dash** app to update its Event logs after the **Dash** app has been closed down for a period of time and restarted. If you are storing the data on the Dash cloud, your IoT device can ignore event log update request messages from the **Dash** app.

The Event Log display does not have any Event Log specific parameters.

15. Map Display



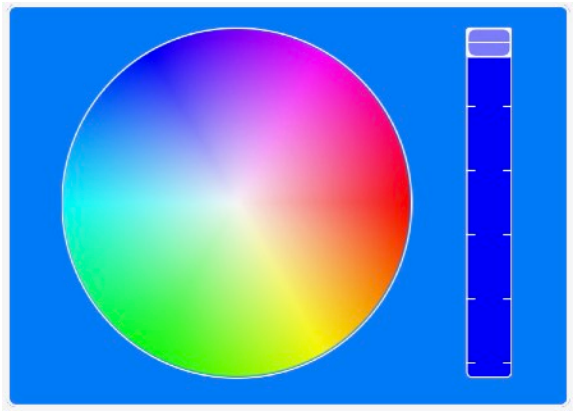
A Map display is used to plot positions on a map. The Map display receives messages from the IoT Device that contain latitude and longitude to mark the position. Additional data, such as speed and altitude may also be included and shown on the Map display.

Multiple IoT devices may be assigned to a single Map display.

The Map display specific parameters are as follows:

Parameter	Purpose
Map Assets	Menu that enables the Map Assets to be edited
Track Length Units	Units for defining the length of the displayed Map Track
Track Length	Maximum length of the Map Track using the Track Length Units.

16. Color Picker

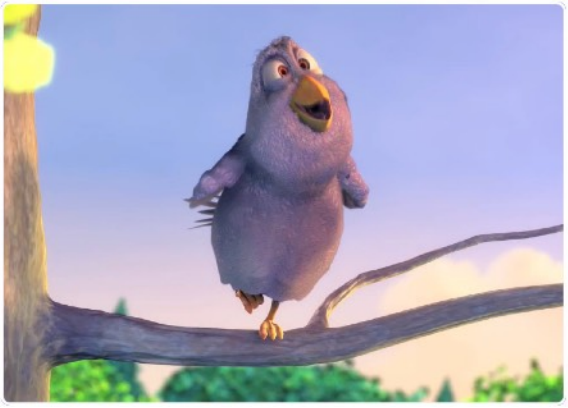


A Color Picker control is used to select a color to send to the IoT device. The Color Picker may be shown as either a spectrum or as a color wheel and brightness slider.

The Color Picker control specific parameters are as follows:

Parameter	Purpose
Picker Style	Style of the color picker: • **Wheel** - color wheel and brightness slider. • **Spectrum** - spectrum of colors.
Send Message Only On Release	When enabled the **Dash** app will send a single message to the IoT device when the user finishes moving the colour selector and releases their finger from the control. When disabled, the **Dash** app will continuously send messages to the IoT device as the slider is moved. This is not suitable for controlling devices over wide area networks, but typically works well with Bluetooth light (BLE). For MQTT connections, messages are only send when the user finishes moving the colour selector.

17. Audio Visual Display



An Audio Visual display allows the IoT Device to send a URL to the Dash app to play or display the contents of the URL.

The Audio Visual display specific parameters are as follows:

Parameter	Purpose
URL	URL of the audio visual stream to be displayed.

17. Table Display

A Table display is a flexible control for displaying tabulated data. Message sent from the IoT device add and update a row in the table. Rows can also be deleted and the table can be cleared of all data.

	Avge	Min	Max
Freezer 1 (°C)	-4.1	-4.2	-3
Freezer 2 (°C)	-4.3	-4.5	-2.9
Freezer 3 (°C)	-3.9	-4.1	-3
Outside (°C)	21	18	24
Zone 1 (°C)	12	8.1	16
Zone 2 (°C)	11	6.3	15
Humidity (%)	78	54	84

Parameter	Purpose
Number of Columns	Total number of columns in the table, including the label column
Column Headings	Headings for each column can be entered here
Font Size	Font size for the text in the table
Label Columns Width Percent	Percentage of the width of the control that the label column uses
Numeric Precision Override	When the data received is numeric, the number is displayed according to the Numeric Precision Override. When the Numeric Precision Override is set to **off**, the number will be display to the same precision that it is received as in the message data. Otherwise, the number is presented to the numeric precision override specified.

18. Label

A Label is a simple control to add structure to your layout on the **Dash** app. They do not transfer information with IoT devices.

The Label specific parameters are as follows:

Parameter	Purpose
Label Style	Style of the label: • **Basic** - text only and in center • **Border** - border with text in center • **Group Border** - border controlled by page theme with text in the title box position. • **Group Fill** - solid fill background color with text in the title box position.
Color	Color of the text and border or fill of the label