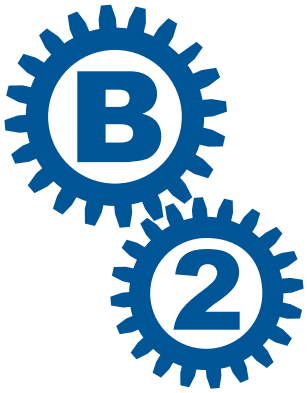
BC2 Tablet Config User Manual

SunovaWorX Inc.

Version: v2020-3-g8f1c12a Date: 2020-10-29



SunovaWorX Inc.

Broadcaster 2
Remote Engine Controller

Contents

Chapter 1

Introduction

1.1 Purpose

BC2 Config is a computer program that helps to set up and configure the BC2 Tablet Interface computer program. The settings and values it creates exist only on the tablet computer on which it is run, and have no effect on settings set on other tablets or other engine controllers.

1.2 Installation

BC2 Config comes pre-installed on any tablet computers supplied by SunovaWorX.

1.3 Starting

To start BC2 Config, double-tap the BC2 Config icon. Figure 1.1 on page 2 shows what the icon looks like.

Figure 1.1: BC2 Config program icon

Chapter 2

Usage

BC2 Config has two main tabs: **`Tablet Settings`** and **`Pumps`**. The **`Tablet Settings`** are shown with a blue background, and settings related to **`Pumps`** are shown with a green background. It is important to avoid confusing these two types of settings.

2.1 Tablet Settings

2.1.1 Tablet ID

This value is the unique ID number for the tablet — think of it like an *address*.

To enter a value, tap the textbox to trigger a number entry dialog box to become visible. The allowed range is 128 to 254.

The tablet ID number **must not** be used by any other tablets on the same radio channel.

2.1.2 Channel

Originally used with radio only in BC1, Broadcaster 2 (BC2) uses this value for *all* communication methods — not just radio. Only tablets and engine controllers with the same radio channel may communicate with each other. The channel number may be set from 0 to 255.

Use this value to segment different pumping jobs: if an **`ALL STOP`** command is sent from a tablet, for example, it will only apply to engine controllers sharing that channel number.

Warning: The radio channel number **must** match the **`settings`**>**`unit`**>**`channel`** number set on any engine controller to be controlled with this tablet.

2.1.3 Communication Options

Broadcaster 2 currently supports several communication methods. Figure 2.1 on page 6 illustrates which modes of communication are interoperable.

These communication methods can be individually enabled or disabled. When issuing outgoing commands, BC2 Tablet Interface will attempt to use multiple communication methods, where

possible. If a communication method is enabled, but purposefully not connected, BC2 Tablet Interface will take longer to give up sending messages via that method. Disabling a communication method avoids this.

BC2 Tablet Interface has blinking icons to indicate non-functioning communication methods; these icons are hidden when communication methods are disabled.

If a communication method stops working, do not disable it. Consider resolving the underlying issue first, as Broadcaster 2 is designed with communication redundancy in mind.

2.1.3.1 Radio

Tap the **Radio** on/off toggle to enable/disable radio communications.

2.1.3.2 BC1 Compatibility

It is possible to operate older Broadcaster 1 engine controllers and remotes on the same channel as newer Broadcaster 2 engine controllers and tablets. Broadcaster 2 also supports the use of older Broadcaster 1 remotes.

In order for this communication to be possible, however, the **BC1 Compatibility** option needs to be enabled on **each** Broadcaster 2 device, whether tablet or engine controller, using the setting **settings**>**unit**>**bc1.compatibility**.

Warning: Only enable this option if you require the ability to interoperate BC1 and BC2 devices. If enabled, the option needs to be enabled on every BC2 device, including other tablets.

2.1.3.3 Radio DES Key

Broadcaster radio communication is encrypted using the DES encryption algorithm, and requires the use of an encryption key. This key is represented in BC1 and Broadcaster 2 by six hexadecimal digits. By default, the key is **00 00 00**. Radio communication will work with this default value.

However, the DES key is useful in situations where operators want to ensure that only their own devices communicate with each other, without radio traffic from *other* BC1 or Broadcaster 2 operators entering the radio mesh network. Just as radio channels segment pumping jobs, the DES key segments or separates operators.

The DES key setting **must** match on each tablet and each engine controller. For BC1, the setting is **Radio**>**DES**. For Broadcaster 2 the setting is **settings**>**unit**>**des.key**.

A radio that receives a message sent from a radio with a *different* DES key value will silently discard the message, and will not forward it to other radios in the network. If you are using non-default DES keys, be extra careful that *all* devices, including repeaters, use the same DES key value.

2.1.3.4 Cell-Sat

Tap the **Cell-Sat** on/off toggle to enable/disable communication via the cell-sat module.

2.1.3.5 Internet (WiFi, Ethernet, SIM)

Tap the **Internet** on/off toggle to enable/disable communication via the Internet. Your computer must have an existing Internet connection for this option to work.

2.1.4 Blink Values on Change

Normally, when data values change, the text blinks briefly to indicate that the value has changed. Some operators may find this annoying. This option controls whether values will blink or flash when there is a change.

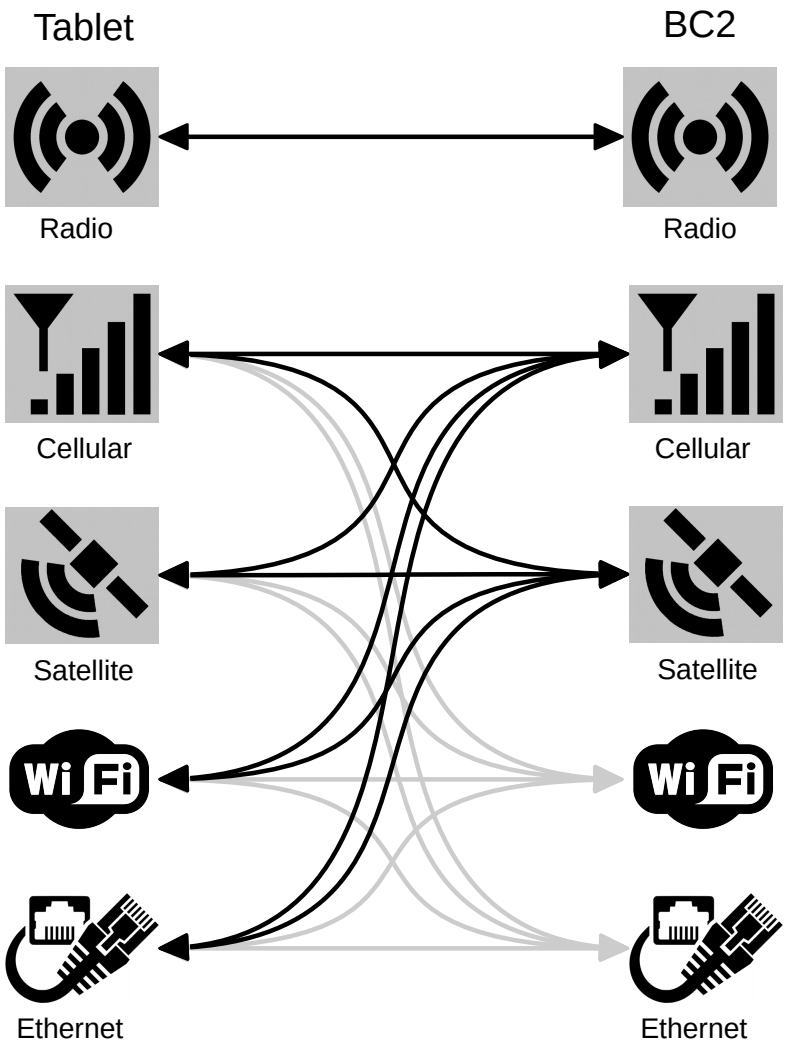


Figure 2.1: BC2 Communication Modes
Diagram: 190068 Version: v1 Date: 2019-02-13

2.2 Pumps

In order for the tablet software to communicate with any pump, information about pumps needs to be entered using BC2 Config. This process is designed to be very simple for typical pump setups. The procedure for creating pump entries can be found in section 2.1 on page 10.

2.2.1 Creating Pumps

To create a new pump, tap the **New Pump** button. An entry will appear at the left side of the screen with the default name (Lead) and the default pump ID (1).

Tapping the **New Pump** button additional times will create additional pump entries, each beginning with the word "Boost".

2.2.2 Changing Pump IDs

To change the ID number of a pump entry (not the actual, physical pump,) first select the entry on the left side of the screen. Tap the **Pump ID Number** text box to enter a new value. Remember that this number must match what is set on the engine controller of this pump. The valid range is from 1 to 127.

2.2.3 Changing Pump Name

While BC2 Config tries to be helpful in guessing a name for each pump as they are entered, you probably have your own names.

To change the name of a pump entry, first select the entry on the left side of the screen. Tap the **Pump Name** text box to enter a new value.

This name is only ever seen on this tablet - it is just a label or description for this pump and is not used when routing radio traffic the way IDs are used.

2.2.4 Toggling Individual Pumps

It is useful to temporarily hide specific pumps in the BC2 Tablet Interface, depending on the needs of the pumping job.

To prevent a pump from appearing in BC2 Tablet Interface, tap the **On** switch to the left of a pump entry, to change it to **Off**. You will notice the switch becomes grey. Tap it again to re-enable.

Figure 2.2: A pump entry that is on/enabled

Figure 2.3: A pump entry that is off/disabled

2.2.5 Copying Pumps

If you have one pump set up the way you like and want to create a second pump entry that is essentially identical, first tap the pump menu button — it looks like:

and then tap the **`Copy Pump`** button. A new pump entry will appear in the list but it will have a different name and ID. BC2 Config automatically names your new pump and assigns an unused ID number.

If you have already set up your actual, physical pump with an ID number, you will still need to edit the ID number here so that the numbers match.

2.2.6 Deleting Pumps

Deleting a pump entry uses a similar process as copying one — first tap the pump menu and then tap the **`Delete Pump`** button. You will be prompted to confirm that you really want to delete the pump entry.

Pump entries that participate in calculations cannot be deleted or toggled. This prevents inadvertently breaking calculations. In addition, calculations in use by display rules cannot be deleted either. See Sections 2.7.2 and 2.7.3.3 on pages 17 and 18, respectively, for deleting display rules and calculations.

Deleting a pump entry is *permanent*. Before deleting a pump entry, consider whether toggling a pump entry is a better choice. Section 2.2.4 describes how to do this.

2.2.7 Re-ordering Pumps

By default, pump entries are listed in the order they are created. To change the order they appear, first select a pump entry by tapping it, and then tap one of the large arrow buttons to the right of the pump entries. With these arrow buttons, you can move pumps up and down in the list as needed.

2.3 Pump Metrics

Broadcaster systems report several kinds of metrics[1]. With BC2 Config, you can control how those values are displayed. See Table 2.1 on page 9 for details.

[1] Where equipped in hardware, and where properly configured on BC2.

Name	Meaning	Allowed Units
RPM	BC2 commanded engine speed	Rotations Per Minute (RPM)
P_IN	Pump inlet pressure	PSI, Kilopascal (kPa), bar, mbar
P_OUT	Pump outlet pressure	PSI, kPa, bar, mbar
OIL_PRESS	Engine oil pressure	PSI, kPa, bar, mbar
ENG_TEMP	Engine temperature	Fahrenheit, Celsius
FLOW	Primary flow rate	L/s, GPM, Bpm, m^3/h
FLOW_AUX1	Auxiliary flow rate 1	L/s, GPM, Bpm, m^3/h
FLOW_AUX2	Auxiliary flow rate 2	L/s, GPM, Bpm, m^3/h
FLOW_AUX3	Auxiliary flow rate 3	L/s, GPM, Bpm, m^3/h
FLOW_AUX4	Auxiliary flow rate 4	L/s, GPM, Bpm, m^3/h
FLOW_SUM	Primary flow sum	L, gal, m^3, acre-ft
FLOW_SUM1	Auxiliary flow sum 1	L, gal, m^3, bbl, acre-ft
FLOW_SUM2	Auxiliary flow sum 2	L, gal, m^3, bbl, acre-ft
FLOW_SUM3	Auxiliary flow sum 3	L, gal, m^3, bbl, acre-ft
FLOW_SUM4	Auxiliary flow sum 4	L, gal, m^3, bbl, acre-ft
WATER_TEMP	Water temperature	Fahrenheit, Celsius
P_AUX1	Auxiliary pressure sensor 1	PSI, kPa, bar, mbar
P_AUX2	Auxiliary pressure sensor 2	PSI, kPa, bar, mbar
P_AUX3	Auxiliary pressure sensor 3	PSI, kPa, bar, mbar
P_AUX4	Auxiliary pressure sensor 4	PSI, kPa, bar, mbar
HYD_PRESS	Hydraulic pressure sensor	PSI, kPa, bar, mbar
COMPRESSOR	Compressor pressure sensor	PSI, kPa, bar, mbar
TANKLVL	Level sensor	percent
ENG_HOURS	Total engine running hours	hours
FUEL	Fuel level sensor	percent
RPM_ACTUAL	Actual engine speed	RPM
BATTERY	Engine battery voltage	volts
ACT_POS1	Actuator position 1	percent
ACT_POS2	Actuator position 2	percent
ACT_POS3	Actuator position 3	percent
ACT_POS4	Actuator position 4	percent
PTO_RPM	Power take-off	RPM

Table 2.1: Available Metric Types

2.3.1 Flow and Flow Sum

As listed in Table 2.1 on page 9, Broadcaster 2 supports five flow meters (one primary and four auxiliary) as well as support for tracking the total or *sum* of the volume pumped from each flow meter. The sum values as reported by BC2 will reset to zero when BC2 is power cycled — the sums are not stored persistently. However, the SunovaWorX web portal tracks the cumulative volume pumped and each value will increase **without resetting to zero**. If you are needing to track volume over a period of hours, days, weeks or per-job, consider recording the sum as indicated on the web portal at the beginning of a job and then again at the end, before subtracting

to get the volume pumped for that period.

2.4 BC2 Config Create New Pump Entry[2]

2.4.1 Summary

These are the steps needed to create and configure a single pump entry within BC2 Config.

2.4.2 Requirements

- Tablet computer with BC2 Config installed
- BC2 Config running

2.4.3 Procedure

1. Switch to the Pumps tab by tapping the **Pumps** tab button.
2. Tap the **New Pump** button.
3. Tap the **Pump Name** text box to enter a name for this pump.
4. Tap the **Pump ID Number** text box to enter an ID for this pump.
5. Tap the **Save and Exit** button to save and commit the changes to disk.

2.4.4 Results

A new pump entry has been created and ready for use within BC2 Tablet Interface.

2.5 Display Options

2.5.1 Name

By default, metrics have short names like 'RPM' for 'Engine Speed' or 'P_IN' for 'Pump Inlet Pressure'. Short text fits on the screen more easily, and these names are kept so that people more familiar with previous versions of this software recognize these values.

However, you may opt to provide custom names for metrics. These names do not alter the behaviour or settings of a pump. To change the name of a metric:

1. Tap the button with the name of the metric you wish to change.
2. Using the on-screen keyboard[3] that appears, using the **Clear** or **Backspace** buttons to erase the current name.
3. Type the new name and press **Enter**.

[2]Procedure: 180176 Version: v1-4-gf5ef5aa Date: 2018-05-30

[3]If you have a physical, hardware keyboard connected to the computer, you may use this keyboard.

There *is* a limit to length of text that can be displayed both here and in BC2 Tablet Interface. If your text is too long, it will be shortened and have an ellipsis (...) to indicate that some characters have been omitted.

2.5.2 Main Display and Side Bar Visibility

Within BC2 Tablet Interface, metrics will appear in two primary locations: the **main display** and the **side bar**. By default, each metric will appear in both locations but you can decide which values are important for display, depending on your needs. For example, Figure 2.4 shows that oil pressure is hidden on the main display, inlet and outlet pressure are hidden on the side bar, but all others are visible.

A third area for displaying metrics is the **summary**. This is a single "page" where metrics from multiple pumps can be displayed together. If no items are selected to appear on the summary, then it will not be visible. By default, items are not shown in the summary.

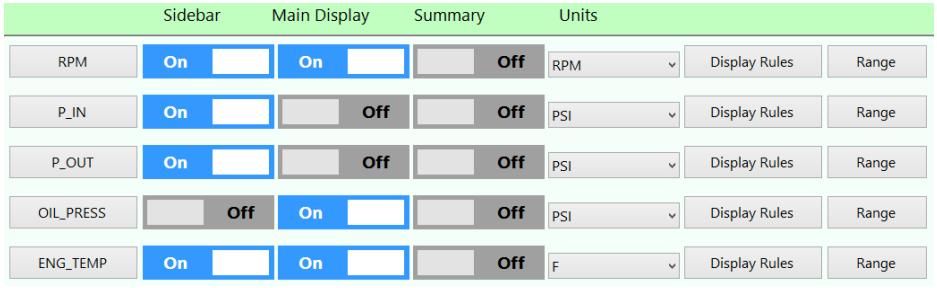


Figure 2.4: Pump display options

Metrics can be displayed in different units. To change the unit in which a value is displayed, tap the corresponding **`Units`** dropdown box. Changing a unit here does not affect the units a pump uses internally, nor does it affect what other tablets may have set for their displays.

2.5.3 Display Rules

The **`Display Rules`** button controls the color and behaviour of metrics within BC2 Tablet Interface. See Section 2.7 on page 15.

2.5.4 Range

Metrics have sensible default *minimum* and *maximum* values that control the scaling of bar graphs within BC2 Tablet Interface. To change these values, tap the **`Range`** button for the metric being changed. Figure 2.5 on page 12 shows an example set of maximum and minimum values for a sensor.

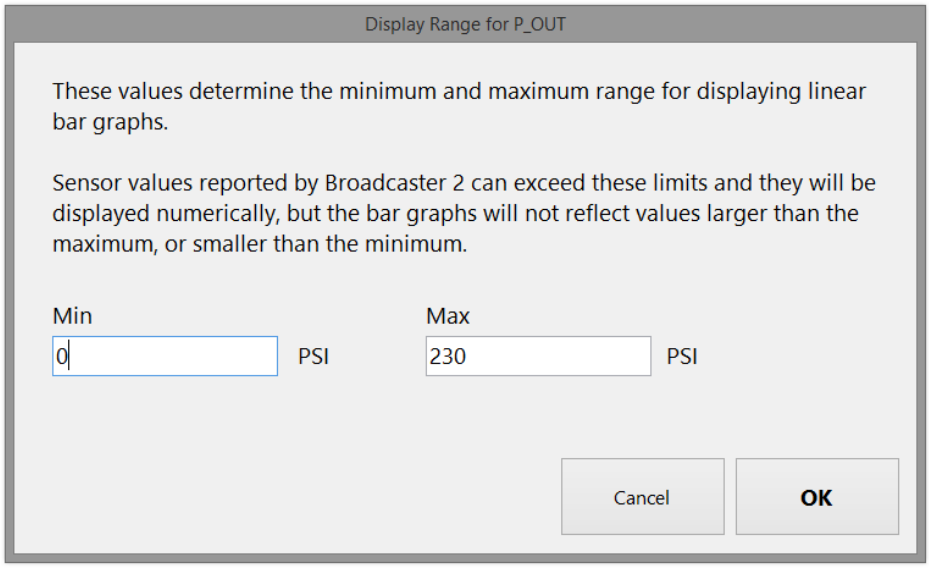


Figure 2.5: Maximum and Minimum data values

2.5.5 Change Display Order of Metrics[4]

2.5.5.1 Summary

This procedure describes the steps needed to change the display order of pump metrics in BC2 Config.

2.5.5.2 Requirements

- BC2 Config running on the tablet
- a pump entry with metrics already configured for display in either the side bar, main display, or summary.

2.5.5.3 Procedure

The general steps needed to re-order a pump's metrics are:

1. Select the pump entry.
2. Tap the button **`Change Display Order`**. A dialog window containing a list of metrics will appear. Figure 2.6 on page 13 shows this window.
3. Select a metric you wish to move, either by tapping it or using the two arrow buttons at the ***right*** side of the list.
4. With a metric selected, use the four **`Move...`** buttons on the ***left*** side of the list to move it into the proper position.

[4]Procedure: 200154 Version: v1 Date: 2020-03-19

- The **`Move Up`** moves a metric *up* one position at a time.
- The **`Move Down`** moves a metric *down* one position at a time.
- The **`Move To Top`** and **`Move To Bottom`** buttons move a metric to the top or bottom of the list, respectively.

5. Repeat the previous two steps until all the metrics are in the desired order.
6. Tap **`OK`**.

Metrics will only appear in this list if they have already been selected for display *somewhere* in BC2 Tablet Interface. The ordering you choose in this window is honoured in the side bar, main display, and summary areas in BC2 Tablet Interface.

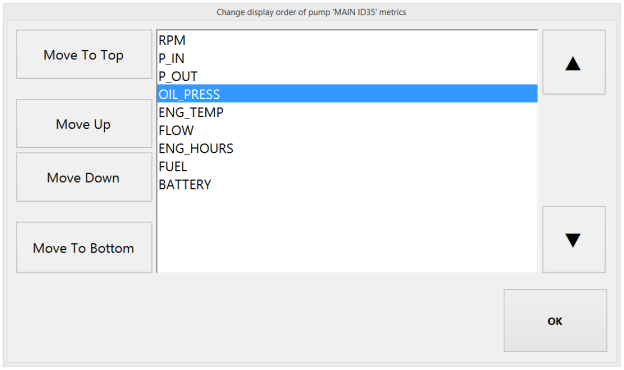


Figure 2.6: Changing the order of displayed metrics.

2.5.5.4 Results

Changing the order of metrics is not difficult but it helps to do this *after* deciding where each metric should be visible.

2.6 Speed Options

2.6.1 Cruise

Pump cruise is configurable in BC2 Tablet Interface when running, but BC2 Config allows you to set the *minimum* allowable max/min values. For simplicity, pressure values are always specified in Pounds per Square Inch (PSI).

To set values for pump cruise, tap the **`Set Up Cruise`** button for a pump. Figure 2.7 shows an example scenario: a minimum target value of 9 PSI and a spread of 2 PSI. This means that the absolute minimum target allowed is $9 - 2$, or 7 PSI, and the absolute minimum max pressure is $9 + 2$, or 11 PSI. Figure 2.8 on page 14 shows what this scenario looks like in BC2 Tablet Interface.

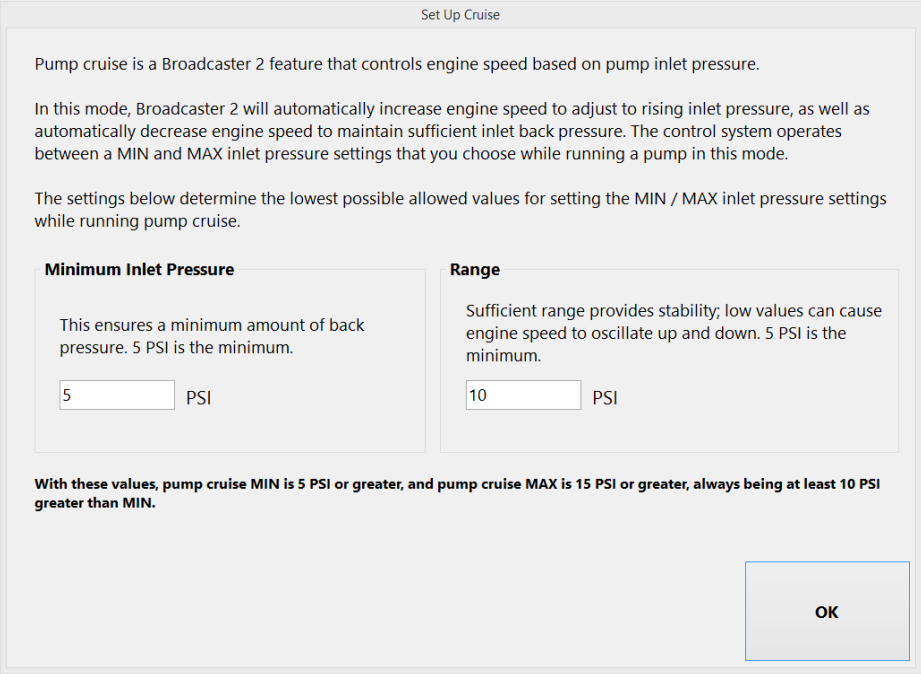


Figure 2.7: BC2 Config **`Set Up Cruise`** window

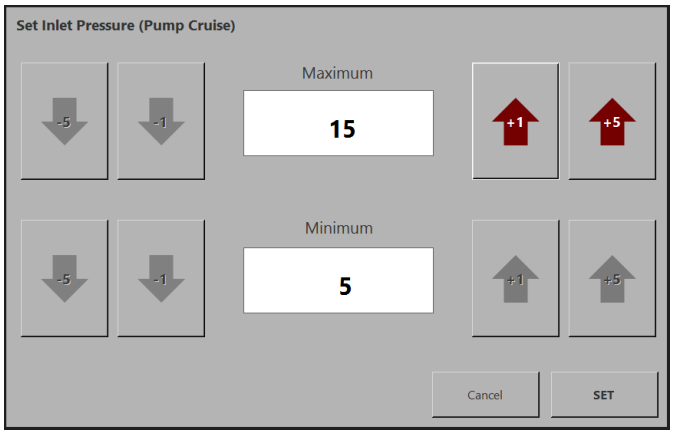


Figure 2.8: BC2 Tablet Interface **`Set Inlet Pressure`** window

2.6.2 RPM Presets

BC2 Tablet Interface supports three preset RPM values, in addition to the *favorite* value. By default, the presets are 1200, 1400 and 1800 RPM. To choose different preset values for a pump, tap the **`Set Up RPM Presets`** button to open a dialog window. Figure 2.9 on page 15 illustrates this dialog window.

RPM preset values must be in the range of 800 to 2600, inclusive. If you enter a value that is not in this range, the value will be set to the closest allowed value.

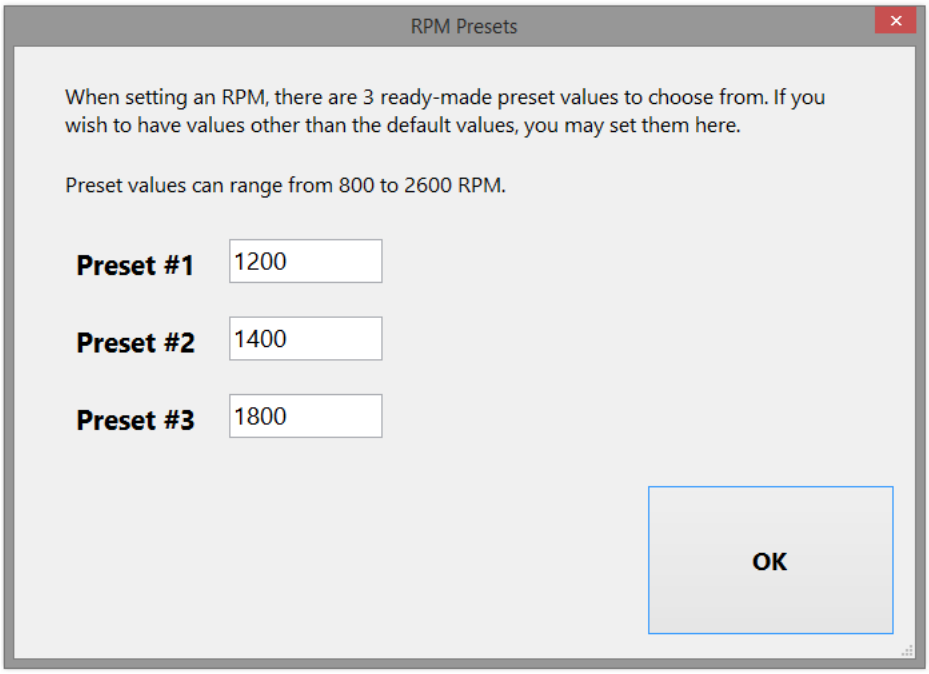


Figure 2.9: RPM Presets

2.7 Display Rules

Display rules determine the behaviour of how individual data values are displayed within BC2 Tablet Interface. With display rules, a specific data value is configurable to display a particular color and, optionally, be accompanied by an audible alarm. An example of such a rule might be to dictate that oil pressure show as a yellow *warning* when it exceeds a certain threshold.

Display rules do not affect the behaviour of physical, real-world pumps.

2.7.1 Creating Display Rules

To create a display rule for a data value, tap its **`Display Rules`** button. In the dialog window that opens, tab **`Add Rule`**. You will see a new display rule added to the list.

By default, display rules won't do anything interesting: you will need to configure some options to get it to behave as desired.

The units of a particular display rule are inherited from its parent data value. If creating a rule for oil pressure and the units of oil pressure are set to PSI for that pump then the newly-created display rule will use PSI as well.

Figure 2.10: An example display rule prior to any configuration.

2.7.1.1 Color and Sound

Display rules come with five choices that determine color and sound:

- Default — Gray
- OK — Cyan
- Warning : Orange
- Warning (with sound alarm) — Orange accompanied by audible alarm
- Danger (with sound alarm) — Red accompanied by audible alarm

2.7.1.2 Specifying When Display Rules Should be Evaluated

Display rules can be triggered at *any time* or only *when running*. With the second option, a rule will only be evaluated if a valid RPM value is seen.

2.7.1.3 Comparison

Display rules operate on a comparison between 2 values: the current data value and some threshold value ± some tolerance. There are many kinds of comparison to choose from:

- no matching rules — the default, which does not result in the rule being evaluated
- equal to — the data value and the threshold value must match
- *not* equal to — the data value and the threshold value must not match
- greater than — the data value must be more than the threshold value
- greater than or equal to — the data value must be more than or equal to the threshold value
- less than — the data value must be less than the threshold value
- less than or equal to — the data value must be less than or equal to the threshold value

A *value* ± *tolerance* is displayed when a comparison other than *no matching rules* is selected. Tap each box to enter in an appropriate value. Figure 2.11 shows an example value of 2200 with a tolerance of 0.

Figure 2.11: An example display rule for RPM after being configured to alarm when above 2200 RPM.

2.7.1.4 Multiple Display Rules

BC2 Tablet Interface supports multiple display rules *per* data value. Rules are evaluated in order of severity. This means that *Danger* rules are evaluated before *Warning* rules.

2.7.2 Removing Display Rules

Use the **Clear All Rules** within the Display Rules dialog window to delete all rules defined for a particular pump entry's data value.

2.7.3 Complex Calculations

Display rules, on their own, take sensor values from a particular pump and compare them with a static/fixed/un-changing comparison value. In most situations, this meets the needs of an operator.

However, there are situations where more complex comparisons are desired. For example, an operator may wish to compare a flow meter value on one pump with the *sum* of some flow meter values on other pumps. The red **Calculations** tab is provided specifically for creating composite data values for use in display rules.

2.7.3.1 Creating a Calculation

To create a calculation:

1. Tap the red **Calculations** tab.
2. Tap the **New Calculation** button. The **Add/Edit Calculation** dialog box will open. Figure 2.12 on page 18 shows what this window looks like when first opened.
3. Choose which **Sensor Data** upon which this calculation will operate.
4. Choose which **Type of Computation** to use. For example, use *Sum* to add multiple values.
5. Depending on the sensor data type, choose the desired **Units**. If there is only one allowed unit type, it will be selected automatically.
6. From the **All Enabled Pumps** list on the left side of the dialog window, tap one of the pumps that will participate in the calculation, and press the **Add** >> button to move it to the list of **Selected Pumps**.
7. Repeat the previous step for all pumps participating in the calculation.
8. Tap **OK**.

If you do not see a pump in the list of **All Enabled Pumps**, make sure the pump entry is enabled. Disabled pump entries cannot participate in calculations. Enabling pump entries in described in Section 2.2.4 on page 7.

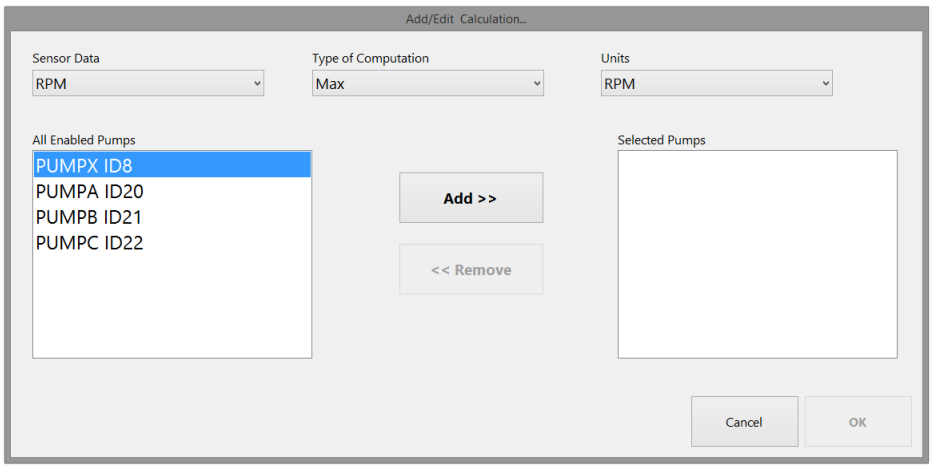


Figure 2.12: The **Add/Edit Calculation** dialog box.

2.7.3.2 Using a Calculation in a Display Rule

With a calculation created, it is available for use when configuring a display rule of the same sensor data type. Figure 2.13 on page 18 shows what this looks like. Switching a display rule from a plain value to a calculation is simple: tap the toggle so that it shows **Calc** and if there is more than one calculation type, choose it from the list. Figure 2.14 on page 18 shows what this looks like.

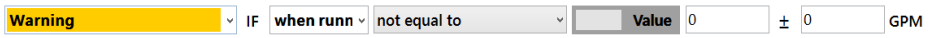


Figure 2.13: A display rule with toggle **value** indicating a calculation is available.

Figure 2.14: A display rule with toggle **Calc** indicating that this display rule uses a calculation of other pump sensor values.

2.7.3.3 Removing a Calculation

To remove/delete a calculation, select it in the **Calculations** tab and using the calculation menu button  and select **Delete**.

Calculations in use by display rules cannot be deleted. See Section 2.7.2 on page 17 for information on deleting display rules.

2.8 Adding and Removing Valves/Outputs

Broadcaster 2 supports the operation of hydraulic valves and general outputs but these need to be configured on both the engine controller as well as in BC2 Config. For the purpose of this document, the terms *valve* and *output* will be used interchangeably.

With a pump entry selected, tap the **Set Up Valves** button. The Set Up Valves dialog window will appear as shown in Figure 2.15 on page 19. This dialog allows you to **Add** and **Remove** valve entries as well as change how they are displayed and operated in BC2 Tablet Interface.

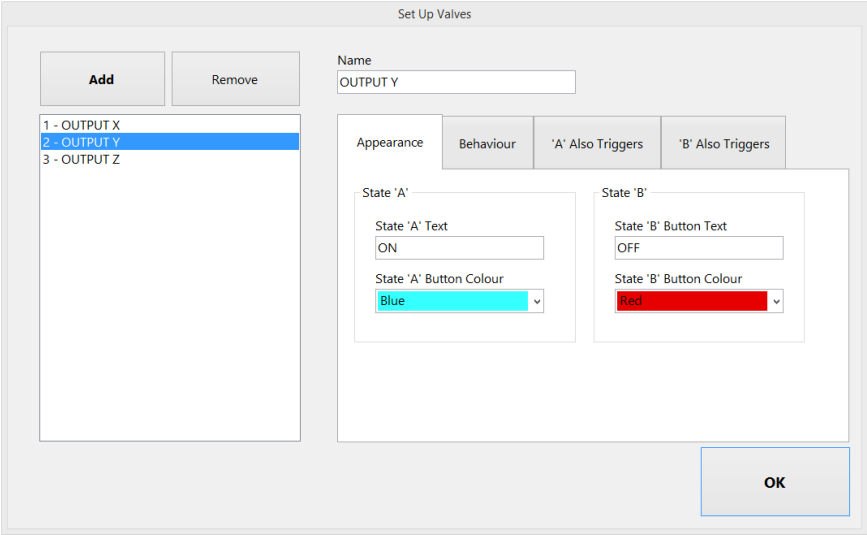


Figure 2.15: Set Up Valves dialog window

2.8.1 Creating Valves

To create a valve, tap the **Add** button. Valves are named automatically starting with *VALVE 1*.

2.8.2 Removing Valves

To remove a valve, tap its name in the list to select it, and then tap **Remove**.

2.9 Configuring Valve/Output Options

Valves support several options for configuring how they appear and how they are operated within BC2 Tablet Interface.

In order to reduce the potential for confusion when wiring out valves and outputs, both the tablet software and Broadcaster 2 refer to the two possible states or positions of an output, 'A' and 'B'. So while one output might be "Open" and "Close", another might be "On" and "Off" or "Faster" and "Slower". Worse still, the "Open" and "Close" states could be reversed, depending on how things are physically wired and connected. Using 'A' and 'B' to refer to the two states helps avoid problems. Section 2.9.2 on page 20 explains how to name these positions or states to match how your hardware is physically wired.

To change a valve's properties, first select it by tapping it in the list of valves.

2.9.1 Name

Tap the **Name** text box to change the name.

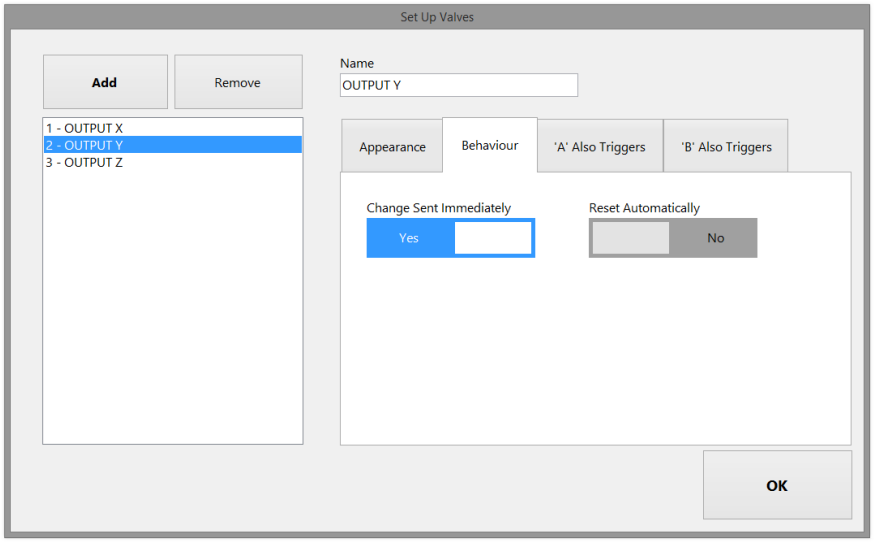


Figure 2.16: Set Up Valves: Behaviour tab

2.9.2 Appearance

By default, the text names on the buttons to operate the valve are "Open" and "Close" but you can change these names on a per-pump, per-valve basis. Tap the **`State 'A' Text`** box to change the 'A' state/position text. Change the 'B' state text in a similar manner by tapping the **`State 'B' Text`** box.

Likewise, by default, the colour of buttons in these 'A' and 'B' positions are green and red, respectively. Tap the **`State 'A' Button Colour`** to choose a specific colour for a valve or output button in the 'A' position. Tap the **`State 'B' Button Colour`** to choose a specific colour for a valve or output button in the 'B' position.

2.9.3 Behaviour

Not all hydraulic valves operate the same way; there are some options to control how valve buttons behave in BC2 Tablet Interface.

2.9.3.1 Change Sent Immediately

In BC2 Tablet Interface, by default, valve commands are not sent immediately upon pressing a valve button. Instead, the **`Set Valves`** button needs to be pressed to actually send the command to the engine controller. The reason for this is that this allows several valve commands to be sent all at once.

However, there are situations where this behaviour is not desirable, and so valves have a Change Sent Immediately toggle option. When set to **`Yes`**, this option causes the valve to be operated without the need for the **`Set Valves`** button.

This option is illustrated in Figure 2.16 on page 20.

2.9.3.2 Reset Automatically

In some situations, real-world hydraulic valves or general outputs can be operated repeatedly. For this case, the Reset Automatically option causes a valve button to be pressed multiple times, with a short delay between presses.

This option is illustrated in Figure 2.16 on page 20.

Only use this option if your hardware and situation require it.

2.9.4 Setting up Dependent Outputs in BC2 Config[5]

2.9.4.1 Purpose

Depending on your particular requirements, your situation may benefit from having multiple outputs triggered from a single button press within BC2 Tablet Interface.

This procedure describes how to set up BC2 hydraulic valves (or general outputs) so that one or more are triggered at the same time.

2.9.4.2 Requirements

This procedure assumes you have existing and working valves/outputs already set up in BC2 Config, which correspond correctly with virtual outputs configured in the BC2 engine controller.

2.9.4.3 Understanding Dependent Outputs

Each valve/output has the option to, when triggered, *also* trigger one or more additional valves or outputs. This documentation will refer to these additional outputs as *dependent outputs*. The triggered outputs can be the same or different depending on the desired state of the triggering output. For example, an output named "VALVE1", when commanded to state 'A', might need to also trigger "VALVE2" in the 'A' state but not trigger anything when commanded to the 'B' state. This offers a fair bit of flexibility when deciding how outputs should trigger.

2.9.4.4 Adding a Dependent Output

To assign a dependent output to a triggering output belonging to a pump entry in BC2 Config

1. Open the **`Set Up Valves`** window.
2. Select (tap) the valve or output that will trigger the dependent output.
3. Select (tap) one of two **`Also Trigger`** tabs:
   - If the triggering output state is 'A' then choose the **`'A' Also Triggers`** tab.
   - If the triggering output state is 'B' then choose the **`'B' Also Triggers`** tab.
4. Press the **`Add`** button.
5. Choose the desired **`Output`** from the drop down list.

[5]Procedure: 190285 Version: v0-3-g24dc2b1 Date: 2019-05-29

6. Choose the desired **State** from the drop down list.
7. Press **OK**.

2.9.4.5 Removing a Dependent Output

To unassign (disconnect) a dependent output from a triggering output,

1. Open the **Set Up Valves** window.
2. Select (tap) the valve or output that has the dependent output.
3. Select (tap) the corresponding **Also Trigger** tab:
   - If the triggering output state is 'A' then choose the **'A' Also Triggers** tab.
   - If the triggering output state is 'B' then choose the **'B' Also Triggers** tab.
4. Select (tap) the dependent output.
5. On that tab, press the **Remove** button.

After these steps, the output you removed will no longer "fire" when when the triggering output is fired. You can still command the outputs individually.

2.9.4.6 Behaviour

There are two options on the **Behaviour** tab that control how BC2 Tablet Interface triggers valves or outputs. These options also affect how dependent outputs behave, as this section will describe.

2.9.4.7 Change Sent Immediately

Dependent outputs *inherit* Change Sent Immediately behaviour from the triggering output. For example, if output X triggers Y and X has this option

- *on*, then both X and Y will be sent immediately, even if Y has this option *off*.
- *off*, then X and Y will need to be sent with the **Set Valves** button, even if Y has this option *on*.

This guarantees that dependent outputs and their triggering output are commanded simultaneously.

2.9.4.8 Reset Automatically

If a triggering output has *any* dependent outputs with the Reset Automatically option *on* then, when triggered, the triggering output will auto-reset (meaning it will be unavailable for a few seconds), even if this option is not enabled for that output.

This guarantees that a dependent output cannot be triggered prior to the time-out, even if triggered through another output.

2.9.4.9 Results

For situations that require several outputs to be triggered simultaneously via one button press in BC2 Tablet Interface dependent outputs provide this functionality. Adequate testing should be conducted to ensure that proper hardware support for these outputs is present; simply configuring outputs in BC2 Config will not guarantee desired output behaviour.

2.10 Reset Formats

Broadcaster 2 emits engine and pump telemetry using *formats* — sequences of numbers that instruct BC2 Tablet Interface how to correctly interpret sensor data. Once a tablet has the correct formats stored, it will remember them forever, so obtaining the correct packet formats is generally only an initial setup issue. In the event that additional sensors or engine metrics are enabled on the engine controller, the tablet will need also need to know about this change. Normally, BC2 Tablet Interface is smart enough to figure out when a format on an engine controller has been changed and will request the newest format information from that engine controller. However, there are some cases where this automatic process fails, and BC2 Tablet Interface displays garbled data.

The **`Reset Formats`** forces BC2 Tablet Interface to "start fresh" and will not retain any old information about the formats for a particular engine controller, and will request format information from the engine controller at the next available opportunity.

To use this feature:

1. Set the **`Reset Formats`** option to **`Yes`**.
2. A message box will appear, informing that the data formats will be forgotten and re-acquired the next time BC2 Tablet Interface is run. Press **`OK`**.
3. Press **`Save and Exit`** (or **`Save and Resume`**.)
4. With BC2 Tablet Interface running, press **`Update`** for this pump. Depending on the number of packet types in use by this pump and the methods of communication currently available, re-acquiring all the formats may take several minutes.

Having a radio connection to the pump in question is recommended when using this option, as there is a back-and-forth communication process that happens which works faster over radio, compared to cell/sat.

Warning: Use of this option as a general communication troubleshooting tool is not recommened. It is specifically designed for the case when BC2 Tablet Interface is not aware that it has out-dated packet formats, which can happen when an engine controller has been purposefully upgraded to include new or different telemetry values.

2.11 Saving

For simplicity, BC2 Config has a **`Save and Exit`** button at the top-right of the program window which writes all of the configuration data to disk, before closing the program.

In the event you wish to close the program without saving, you may tap the **Exit** button — you will be asked if you want to quit without saving.

2.12 Importing and Exporting Tablet Configuration[6]

2.12.1 Purpose

This procedure is describes how to export the tablet pump configuration to a portable file, as well as import that file on another tablet. This is fastest and least error-prone method of making sure that two or more tablets all have the same pump entries.

2.12.2 Requirements

- A tablet running the latest version of BC2 Config.
- A good, working pump configuration with a pump entry defined and configured for each pump, with correct pump ID numbers.
- The tablets to which the configuration will be imported, each updated to the latest version of BC2 Config.
- A portable USB drive for transferring configurations between tablets.

Instead of a portable USB drive, you may opt instead to transfer pump configurations over a local area network or the Internet but describing this is outside the scope of this procedure.

2.12.3 Exporting

When ready to export a tablet's configuration:

1. Insert your portable USB drive into an unused USB port.
2. Navigate to the orange **Import/Export** tab in BC2 Config.
3. Tap **Export: Save Config to File**.
4. In the **Save As** dialog box that appears, navigate to the USB drive and tap **Save**.

By default, the filename is automatically generated as `TabletConfig_yyyyMMdd_HHmm.BConfig` where the `yyyyMMdd_HHmm` portion is the current year, month, day, hour, and minute. You may opt to change the name but this requires the use of the on-screen keyboard.

Importing can be done either from within BC2 Config or by opening the config file. Section 2.12.4 on page 25 describes the former, and Section 2.12.5 on page 25 describes the latter.

[6]Procedure: 190222 Version: v1-1-g9e2cdoc Date: 2019-04-26

2.12.4 Importing from within BC2 Config

1. Run BC2 Config.
2. Insert your portable USB drive into an unused USB port.
3. Navigate to the orange **`Import/Export`** tab in BC2 Config.
4. Tap **`Import: Load Config to File`**.
5. Locate the BConfig file created in Section 2.12.3 on page 24 and open it.
6. If the import was successful, the program will restart. You will be informed prior to this happening – see Figure 2.17 on page 25.
7. **Important: Enter a new Tablet ID.** Make sure you use a number that no other tablet in your system will use.
8. Tap **`Save and Exit`**.

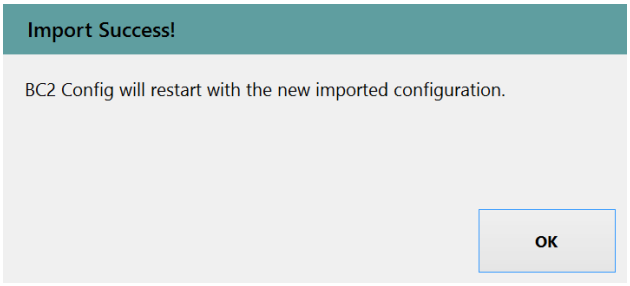


Figure 2.17: A notification about restarting BC2 Config following an import of a pump configuration.

2.12.5 Importing by opening a BConfig file

BC2 Config supports importing by simply opening a BConfig configuration file. When ready to import a tablet configuration from a different tablet,

1. Insert your portable USB drive into an unused USB port.
2. Using Windows Explorer, navigate to the drive and view its contents.
3. Locate the file created in Section 2.12.3 on page 24 and open it.
4. BC2 Config will run, but you will receive a warning (see Figure 2.18 on page 26) that you are about to potentially overwrite data. Tap **`OK`** to acknowledge the warning.
5. **Important: Enter a new Tablet ID.** Make sure you use a number that no other tablet in your system will use.

6. Review the pump data and settings to make sure all they appear as you expect.
7. If satisfied with the settings, tap **Save and Exit** to commit the changes to disk. (If *not* satisfied, tap **Exit** and confim that you do not want to save.)

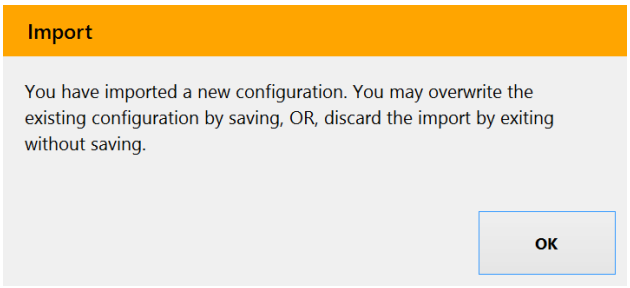


Figure 2.18: A warning about overwriting existing data when importing a pump configuration.

2.12.6 Results

Rather than manually entering the same data on multiple tablets, it is often faster to set up one tablet and then export that configuration for use in other tablets.

2.13 About

The About tab provides information about BC2 Config:

- the program name
- the version number (in the form of x.x.x.x)
- when the program was built or compiled
- a long hexadecimal string indicating the unique fingerprint of this version (this changes automatically when we release new versions)
- the URL of the SunovaWorX support website
- copyright information

Chapter 3

Software Updates

BC2 Config is part of a suite (collection) of programs that are updated as a package. Checking for and running software updates is the responsibility of the BC2 Tablet Interface program. Please refer to the BC2 Tablet Interface User Manual for instuctions regarding software updates.

Table of Contents

[1]Procedure: 180176 Version: v1-4-gf5ef5aa Date: 2018-05-30
[2]Procedure: 200154 Version: v1 Date: 2020-03-19

[3]Procedure: 190285 Version: v0-3-g24dc2b1 Date: 2019-05-29
[4]Procedure: 190222 Version: v1-1-g9e2cdoc Date: 2019-04-26

Version History

```
      2020-10-29   *   Added section on 'Blink
                   |   Values on Change' and removed notice regarding needing satellite module plugged
                   |   in for Internet authorization. Minor formatting changes.
      2020-03-19   *   Added procedure 200154 for changing display order of metrics.
      2020-03-18   *   Added fuel level sensor to table of metrics. Added note about persistent
                   |   flow sums on the web portal.
v2020 2020-03-18   *   Extended tablet of metrics and documented custom metric
                   |   name feature. Minor formatting.
      2020-03-12   *   Fixed duplicate index entries.
      2019-08-05   *   Added documentation about 'Reset Formats' option.
      2019-08-05   *   Re-added procedures 180176, 190222 and 190285 after re-organization.
      2019-08-05   *   Reorganized procedures.
      2019-08-03   *   Template updates.
      2019-07-25   *   Updated template.
      2019-07-23   *   Updated template.
      2019-07-22   *   Updated template and glossary.
      2019-05-29   *   Updated section on valves to include dependent outputs.
      2019-04-26   *   Updated document build system.
      2019-04-26   *   Added title image and improved icon figure.
      2019-04-26   *   Added procedure 190222 for importing and exporting.
      2019-04-22   *   Added section regarding DES key.
      2019-04-17   *   Added information about BC1 Compatibility option. General clean-up of
                   |   document.
      2019-04-17   *   Updated 'range' image.
      2019-04-17   *   Updated template
      2019-04-17   *   Updated template.
      2019-03-22   *   Updated build script.
      2019-03-01   *   Added section describing comm methods and diagram illustrating comm
                   |   interop.
      2019-03-01   *   Updated cruise, valve, and metrics images.
      2019-03-01   *   Updated diagrams submodule.
      2019-01-23   *   Updated sections on valves and metric max/min values.
      2018-11-03   *   Added valve content.
      2018-11-03   *   Submodule changes.
      2018-11-03   *   Submodule changes.
      2018-10-29   *   Removed old build script file no longer used.
      2018-10-26   *   Added RPM presets.
      2018-10-25   *   Added sections on display rules and calculations.
      2018-10-25   *   Submodule changes.
      2018-10-24   *   Submodule changes.
      2018-10-24   *   Submodule changes.
      2018-10-11   *   Added support for version history.
      2018-07-13   *   Submodule changes.
      2018-07-13   *   Work on diagram formatting - multicolumn support.
      2018-07-12   *   Build file tweaks for diagrams.
      2018-07-12   *   Diagram support added.
      2018-07-12   *   Template update
      2018-07-10   *   New glossary items and some work on index.
      2018-06-07   *   Procedure updates.
      2018-06-05   *   Added some new glossary items.
      2018-06-05   *   Moved title page into template_general/title.tex
```

```
      2018-06-05   *   Added document version and date.
v1    2018-06-05   *   Added support for inline procedure versions and dates.
                   |   Re-worked makedoc.bat to be more readable.
      2018-06-04   *   Added new BC2 logo. Submodule updates.
      2018-05-31   *     Merge branch 'master' of
                   |\    //appsrv/Data/SunovaWorx/Engineering/Staff/Documentation/Manuals/bc2_config_manual
      2018-05-31   | *   Changes metrics table to text file.
      2018-05-31   * |   Trying out custom title page with logo. Not ideal but functional.
      2018-05-31   * |   Template updates.
                   |/
      2018-05-30   *   Re-added procedures.
      2018-05-30   *   Removing procedures submodule
      2018-05-30   *   Procedure changes.
      2018-05-30   *   Updated upstream procedures.
      2018-05-30   *   Template tweaks related to subfolder procedures and fixing submodule
                   |   branch issue.
      2018-05-29   *   Procedures submodule connected?
      2018-05-29   *   Added procedures submodule.
      2018-05-29   *   Glossary and procedure changes; prep for re-organizing procedure
                   |   submodules.
      2018-05-29   *   Removed 180176 submodule in prep for re-organizing submodules.
      2018-05-28   *   Re-worked procedure formatting for inline inclusion.
      2018-05-28   *   Got BC2 Config manual compiling.
      2018-05-28   *   Fixed up template issues - now builds.
      2018-05-24   *   Added submodules.
      2018-05-24   *   Initial Commit.
```

List of Figures

List of Diagrams By Name

List of Diagrams By Number

List of Procedures By Name

List of Procedures By Number

Acronyms

BC2	Broadcaster 2 3, 21
kPa	Kilopascal 9
PSI	Pounds per Square Inch 13, 15
RPM	Rotations Per Minute 9

Glossary

m^3	Cubic metres or 'cubes', a unit of volume equal to 1000L.	9
m^3/h	Cubic metres per hour, a unit of volumetric flow rate.	9
acre-ft	Acre-foot, a unit of volume typically used in the US when working with large-scale water systems, such as reservoirs. 1 acre-ft is equal to $1233.48m^3$.	9
bar	A unit of pressure equal to 100 kPa, or 14.5038 PSI.	9
bbl	Barrel, a unit of volume equal to 159.987L.	9
BC2	Broadcaster 2 (BC2). The name of SunovaWorX' Remote engine controller system, which supercedes the earlier Broadcaster 1 remote engine controller.	3, 21
BC2 Config	The software configuration tool for BC2 Tablet Interface.	2, 3, 7, 8, 10, 12–14, 18, 21, 23–27, 29, 31, 32
BC2 Tablet Interface	Previously called 'BC2Gui'. The software program designed for tablet computers, providing command and control of Broadcaster 2 remote engine controllers.	2–4, 7, 10, 11, 13–16, 19–23, 27, 31, 35–37
Bpm	Barrels per minute, a unit of volumetric flow rate involving the ˙	9

Change Sent Immediately	A setting defined for individual valves/outputs in BC2 Config that determines whether such an output is triggered *immediately* when the corresponding user interface button in BC2 Tablet Interface is pressed, or whether the output command is "queued up" pending a subsequent press of the **Set Valves** button.	20, 22
gal	Gallon, a unit of volume equal to 3.785L.	9
GPM	Gallons per minute, a unit of volumetric flow rate.	9
hexadecimal	Refers to a positional number system of base 16 that uses the digits 0-9 to represent values from zero to nine, and letters A-F to represent values from ten to fifteen. Hexadecimal numbers are useful for representing binary numbers, where each hexadecimal number represents four bits or half a byte.	4, 26
kPa	Kilopascal (kPa). The pascal (symbol: Pa) is the SI derived unit of pressure used to quantify internal pressure. It is defined as one newton per square metre. One kilopascal (kPa) is equal to a thousand pascals (Pa).	9
L	Litre, a unit of volume.	9
L/s	Litres per second, a unit of volumetric flow rate.	9
main display	Within BC2 Tablet Interface, this the area in the centre of the screen showing a detailed view of a single pump, selected from the side bar.	11–13, 37
mbar	A unit of pressure equal to 0.1 kPa, or 0.0145038 PSI.	9
PSI	Pounds per Square Inch (PSI). A unit of pressure or of stress based on avoirdupois units. It is the pressure resulting from a force of one pound-force applied to an area of one square inch.	13, 15
pump cruise	A control system feature of Broadcaster 2 where engine speed is determined by an inlet pressure range.	13

pump entry	This document uses *pump entry* to distinguish an item defined in BC2 Tablet Interface from an actual, real-world pump.	7, 8, 10, 12, 17, 19, 21, 24, 31
radio channel	For radio communication, this number corresponds to the common radio wave frequency on which a group of devices communicate. For cell/sat communication, the effect is the same: only devices sharing this number can communicate with each other.	3, 4, 37
Reset Automatically	A setting defined for individual valves/outputs in BC2 Config that determines whether such an output can be triggered multiple times in a given state or position. With this option on, an output's corresponding button in BC2 Tablet Interface will become unusable for a short period of time before being available once more. When off, this option causes an output to be triggered only once in a given position, allowing only the opposite position or state to be commanded.	21, 22
RPM	Rotations Per Minute (RPM). A measure of the frequency of a rotation. It annotates the number of full rotations completed in one minute around a fixed axis. It is used as a measure of rotational speed of a mechanical component.	9
side bar	Within BC2 Tablet Interface, this is the area to the left of the screen showing the list of pumps. This is contrasted with the main display which shows a detailed view of a single pump selected in the side bar.	11–13, 36, 37
summary	Within BC2 Tablet Interface, this is an optional area that displays metrics for multiple pumps on a single "page".	11–13
SunovaWorX	The manufacturer of Broadcaster 2.	26
tablet ID	The number that uniquely identifies a tablet computer within a radio channel. This number is used as an address for determining where radio and cell/sat traffic should be routed.	3

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