

# COMP3004 – Project

Functional design document

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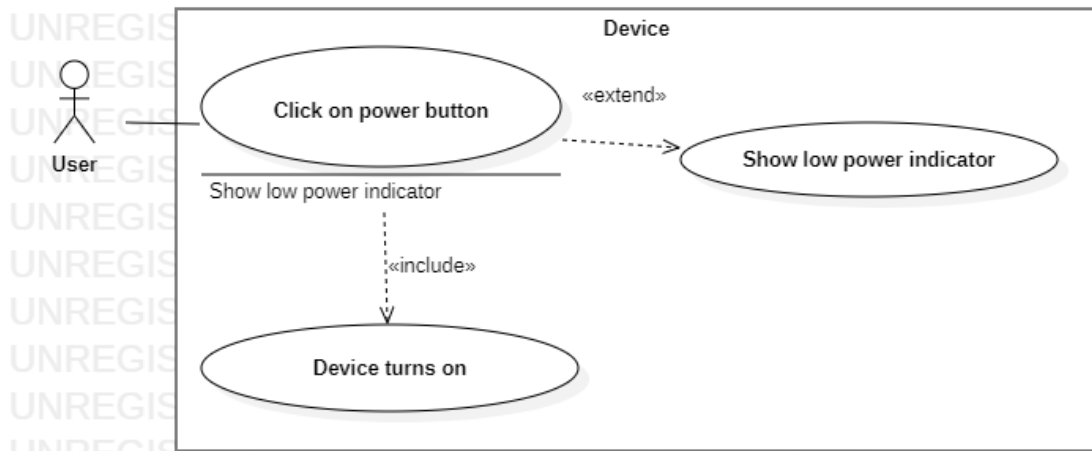
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## Use cases model

### UC1 – Turn on the device



**Author:** Guillaume St-Pierre

**Date:** 2020-03-28

**Version:** 4

**Description:** Describes a user powering up the device.

**Trigger:** A user attempts to power up the device.

**Pre-conditions:**

- The device is currently turned off.

**Main Sequence:**

1. The user clicks on the power button.
2. The device turns on.

**Post-conditions:**

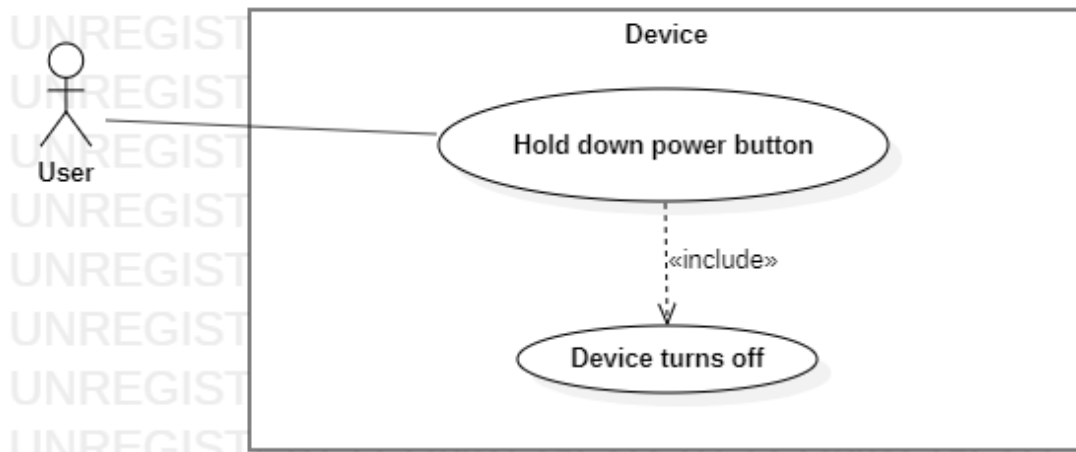
- The device is now turned on.

**Extensions:**

- 1a. The battery has no power left
  - Display a low power indicator

**Comments:** The low battery indicator might not show up if there are no energy remaining in the batteries.

## UC2 – Turn off the device



**Author:** Guillaume St-Pierre

**Date:** 2020-03-28

**Version:** 4

**Description:** Describes a user powering down the device.

**Trigger:** A user attempts to power down the device.

**Pre-conditions:**

- The device is currently turned on.

**Main Sequence:**

1. The user clicks on the power button.
2. The device turns off.

**Post-conditions:**

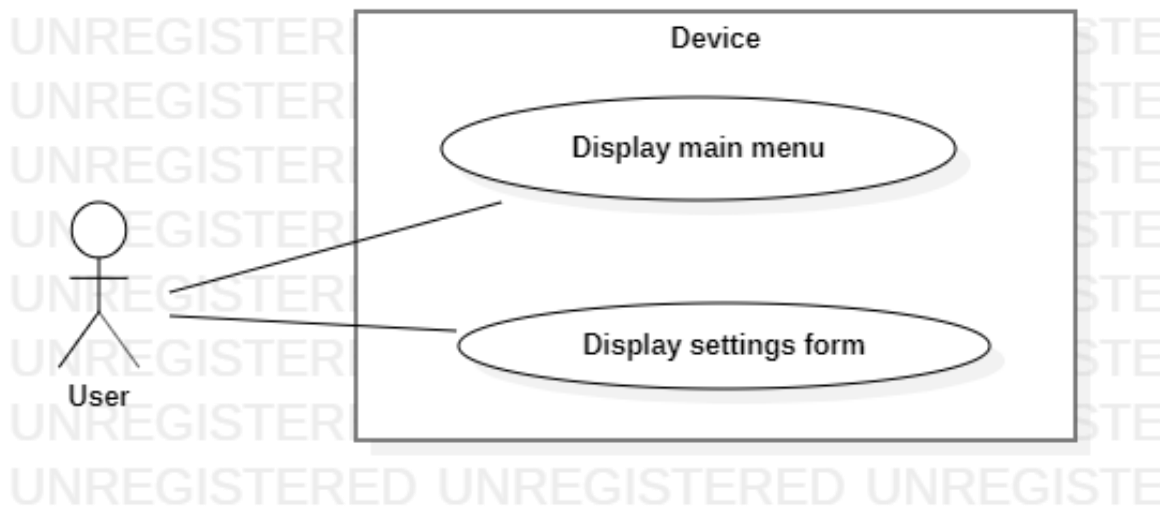
- The device is now turned off.

**Extensions:**

- none

**Comments:** -

### UC3 – Change device's settings



**Author:** Guillaume St-Pierre

**Date:** 2020-03-28

**Version:** 4

**Description:** Describes a user using the built-in menu to change the settings of the device.

**Trigger:** A user attempts to change the settings of the device.

**Pre-conditions:**

- The device is currently turned on.

**Main Sequence:**

1. The user selects the settings option from the main menu.
2. The user modifies specific configurations in the settings menu

**Post-conditions:**

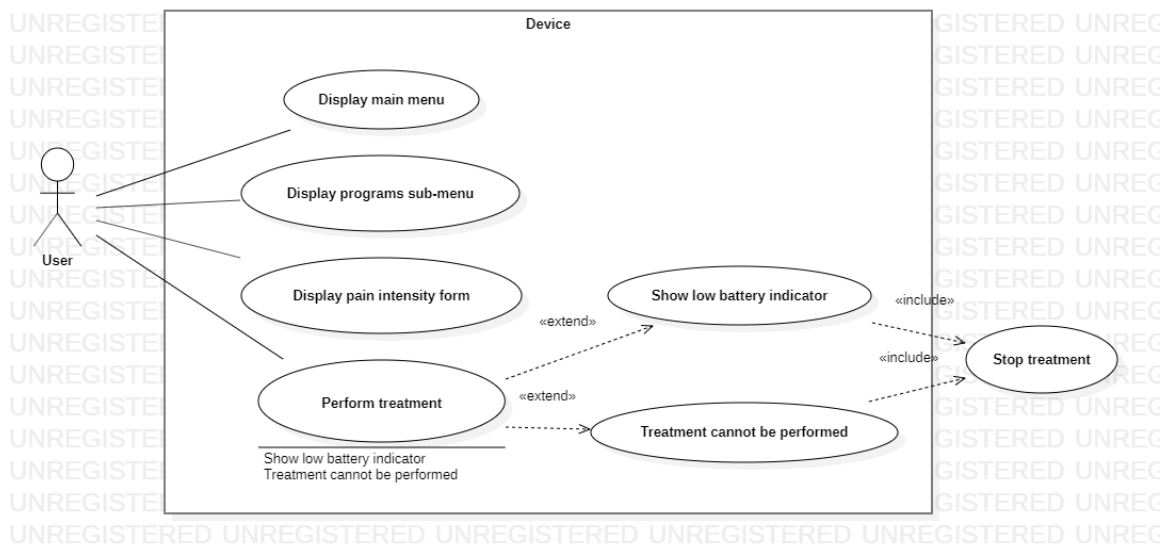
- The device settings are now changed.

**Extensions:**

- 2a. The user clicks the back button
  - Go back to step 1.

**Comments:** -

## UC4 – Perform a specific treatment program



**Author:** Guillaume St-Pierre

**Date:** 2020-03-30

**Version:** 5

**Description:** Describes a user using the built-in menu to select and perform a specific treatment using the device.

**Trigger:** A user attempts to perform a treatment.

**Pre-conditions:**

- The device is currently turned on.

**Main Sequence:**

1. The user selects the programs option from the main menu.
2. The user selects a program from the list of programs.
3. The user changes the pain intensity using the arrow buttons.
4. The user follows the on-screen instructions to perform the treatment.
5. The user waits on the timer to finish the treatment.

**Post-conditions:**

- The treatment is completed.

**Extensions:**

2a. The user clicks the back button

- Go back to step 1.

3a. The user clicks the back button

- Go back to step 2.

4a. The user clicks the back button

- Go back to step 3.

5a. The batteries are low.

- Show a low battery indicator
- Stop the treatment

5b. The treatment requires special electrodes.

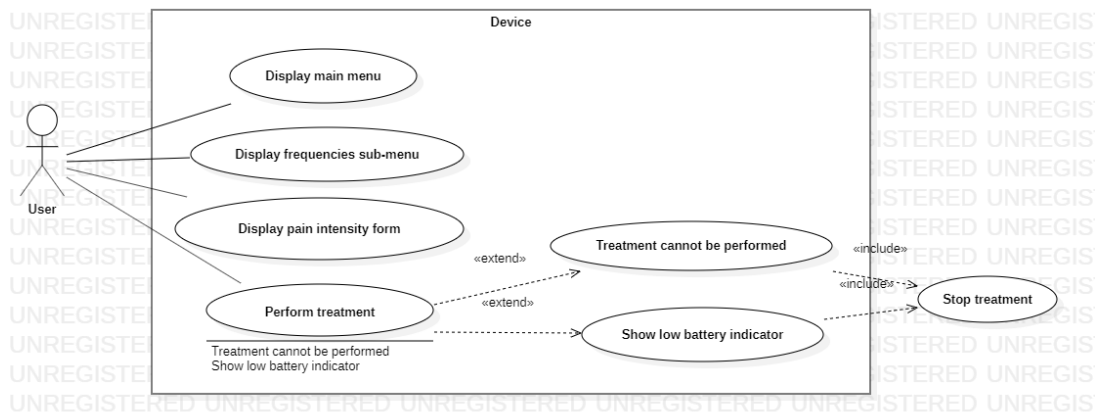
- Inform the user that they need to plug-in the electrodes.
- Wait for the user to plug-in the electrodes.
- Wait for the user to apply the electrodes to their skin.
- Proceed with the treatment.

5c. The user removes the device from their skin before the treatment has been completed.

- Inform the user that the treatment is not finished.
- Wait for the user to put the device back on their skin.
- Resume the treatment.

**Comments:** The low battery indicator might not show up if there are no energy remaining in the batteries.

## UC5 – Perform treatment with a selected frequency



**Author:** Guillaume St-Pierre

**Date:** 2020-03-30

**Version:** 3

**Description:** Describes a user using the built-in menu to select and perform a treatment using the desired frequency.

**Trigger:** A user attempts to perform a treatment.

**Pre-conditions:**

- The device is currently turned on.

**Main Sequence:**

1. The user clicks the menu button on the device.
2. The user selects the frequencies option.
3. The user selects a frequency from the list of frequencies.
4. The user selects the pain intensity using the arrow buttons.
5. The user follows the on-screen instructions to perform the treatment.

**Post-conditions:**

- The treatment is completed.



**Extensions:**

2a. The user clicks the back button

- Go back to step 1.

3a. The user clicks the back button

- Go back to step 2.

4a. The user clicks the back button

- Go back to step 3.

5a. The batteries are low.

- Show a low battery indicator
- Stop the treatment

5b. The treatment requires special electrodes.

- Inform the user that they need to plug-in the electrodes.
- Wait for the user to plug-in the electrodes.
- Wait for the user to apply the electrodes to their skin.
- Proceed with the treatment.

5c. The user removes the device from their skin before the treatment has been completed.

- Inform the user that the treatment is not finished.
- Wait for the user to put the device back on their skin.
- Resume the treatment.

**Comments:**

- The low battery indicator might not show up if there are no energy remaining in the batteries.

## Class Diagram

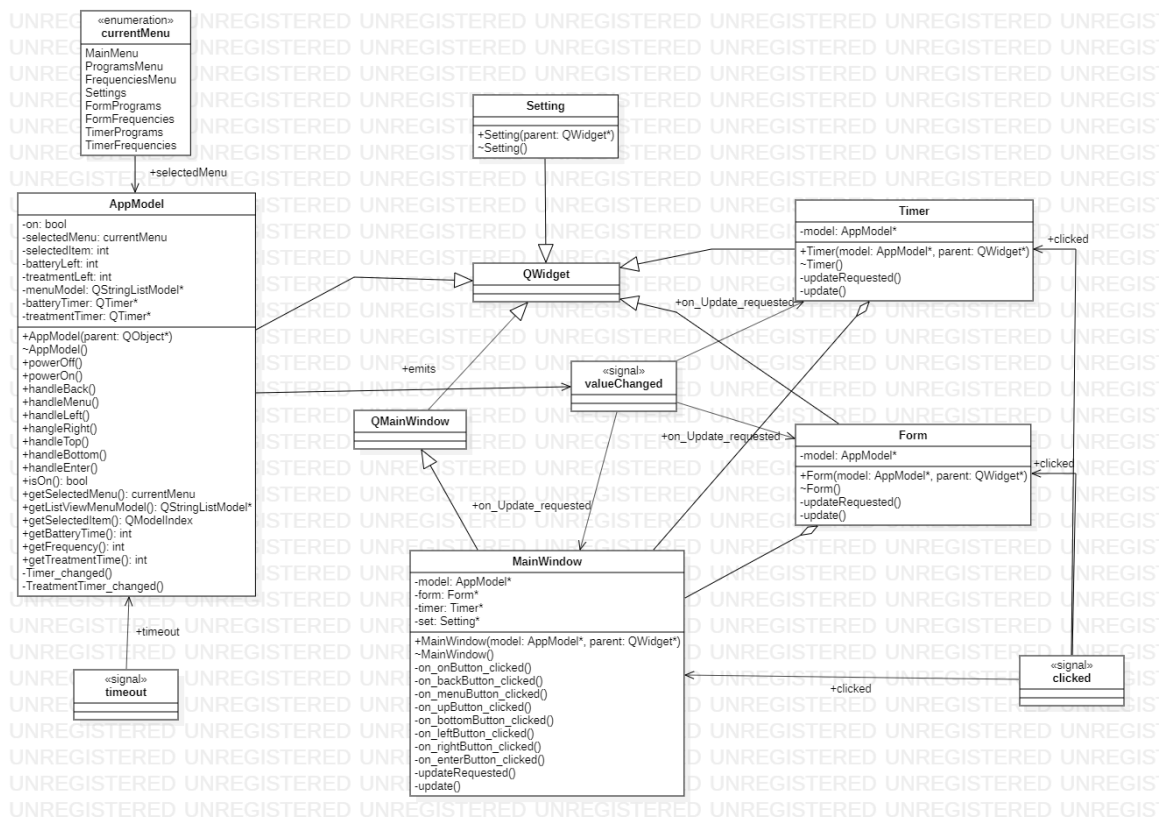


Figure 1 - Class Diagram

Figure 1 represents the main classes used for the app project and their dependencies. It also outlines some of the Qt classes, signals and interfaces which are used class or who are implemented by some of the classes.

Our application uses a MV architecture where the AppModel class acts as our main model for the application which communicate its updates through the QObject observer pattern using the valueChanged signal. The MainWindow, Timer and Form classes act as both views and controllers as they received signals from both the model and their respective UIs. All actions done in the UI are propagated to the model which in turn signals an update to all the views.

## Sequence diagrams

The following sequence diagrams shows the process followed by the user and the system of each use cases.

### UC 1 – Turn on the device

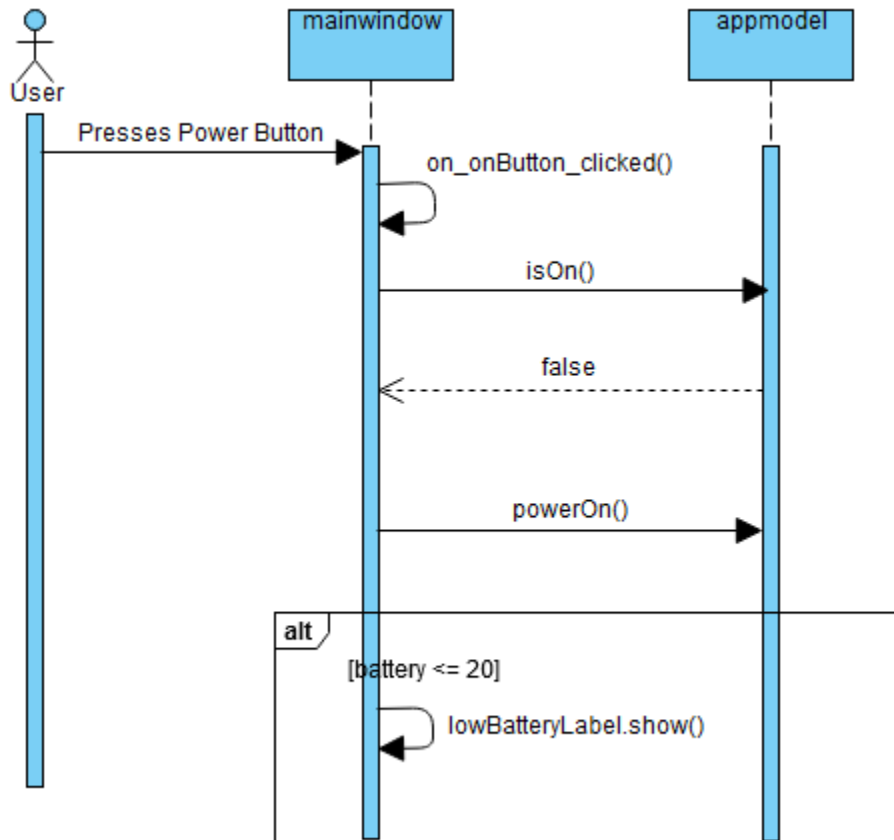


Figure 2 - UC1 Sequence diagram

Figure 2 shows the process used to power up the device inside the application. The alt case is executed when the battery has reached a critical level, currently configured at 20.

## UC 2 – Turn off the device

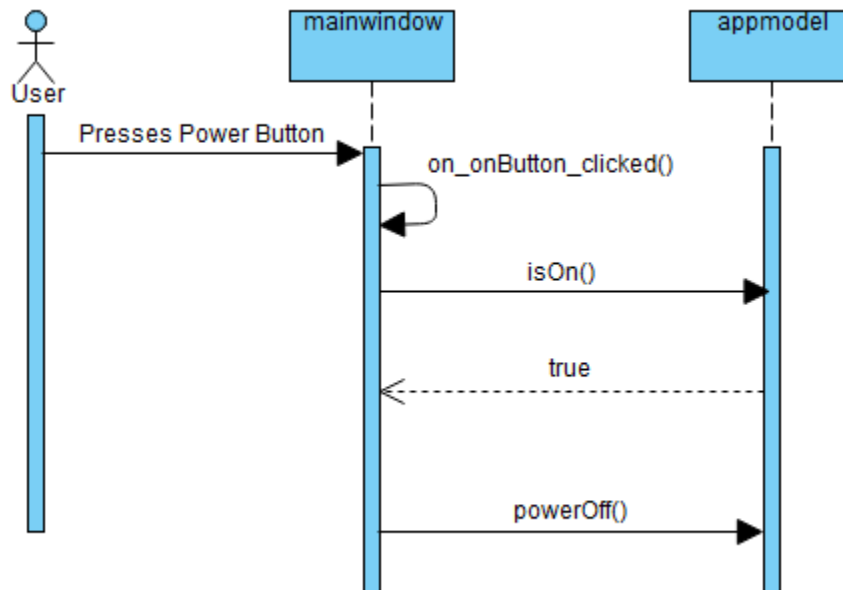


Figure 3 - UC3 Sequence diagram

Figure 3 shows the process used to power off the device inside the application.

## UC 3 – Change device's settings

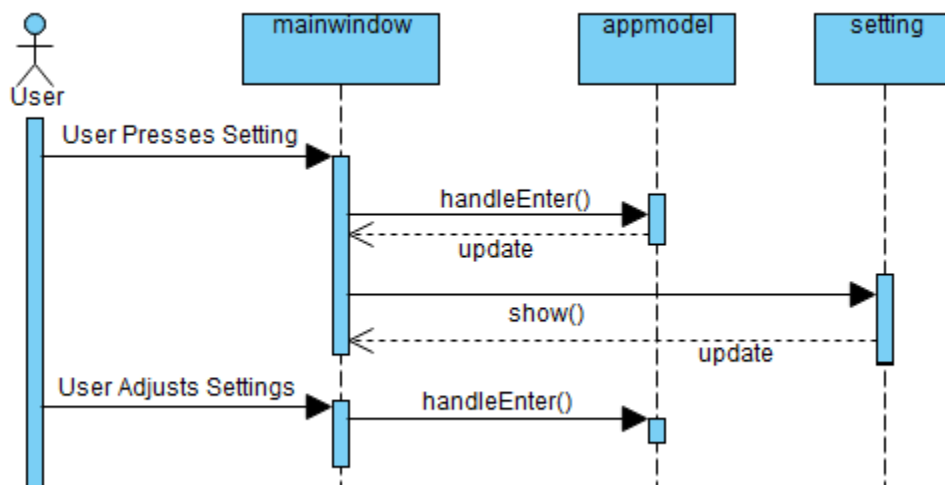


Figure 4 - UC3 Sequence diagram

Figure 4 shows the process used to access and modify the device's settings.

#### UC 4 – Perform a specific treatment program

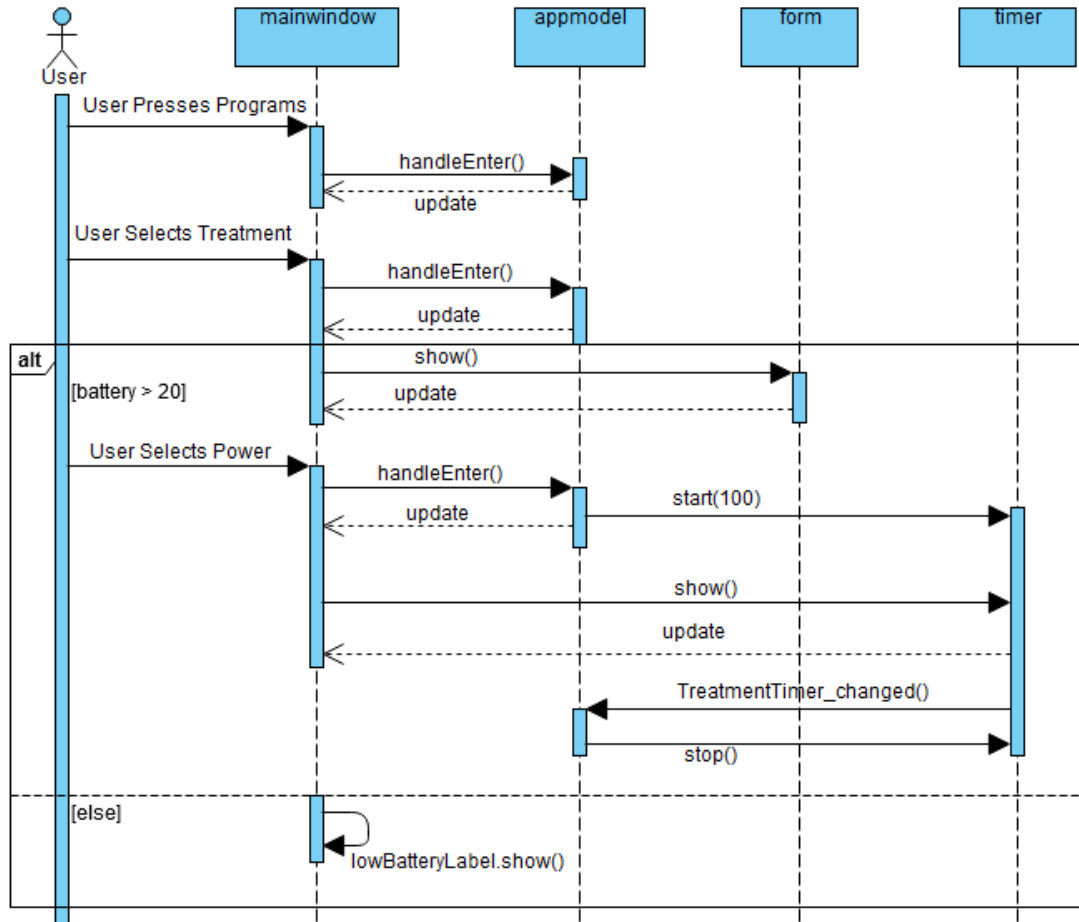


Figure 5 - UC4 Sequence diagram

Figure 5 shows the process used to access and perform a specific treatment program using the device. The alt scenario defines the two possible states for the battery. If the battery level is higher than the minimum configured, then the device will perform the program as expected. Otherwise, it will prevent the treatment from happening and show a low battery indicator.

## UC 5 – Perform treatment with a specific frequency

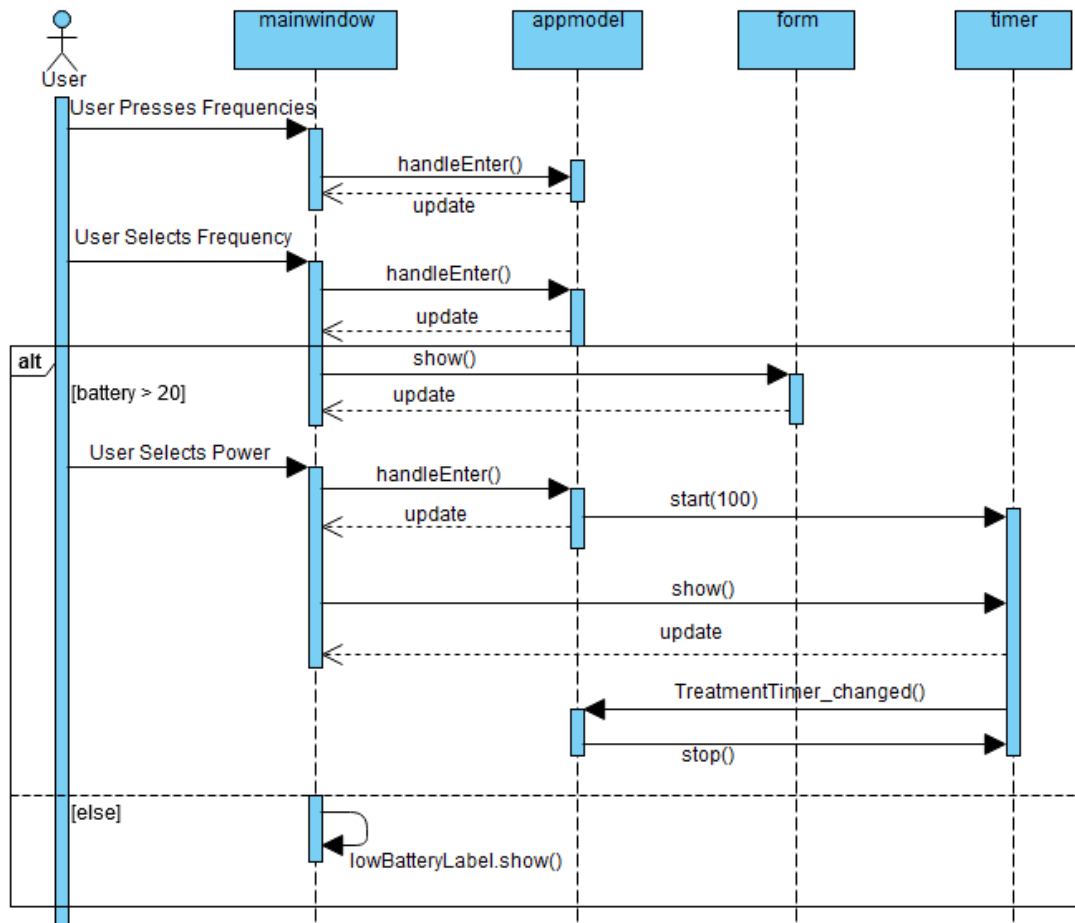


Figure 6 - UC5 Sequence diagram

Figure 6 shows the process used to access and perform a treatment with a selected frequency level. The alt scenario defines the states of the battery as in UC4's sequence diagram.

## Testability Matrix

This matrix is used to report the status of the unit test suites that make sure the use cases work as expected inside the application.

<i>Use case number</i>	<b>Test location</b>	<b>Expected result</b>	<b>Observed result</b>
<i>UC1</i>	tests/tst_uc1.h, tests/tst_uc1.cpp	Passing	Passing
<i>UC2</i>	tests/tst_uc2.h, tests/tst_uc2.cpp	Passing	Passing
<i>UC3</i>	tests/tst_uc3.h, tests/tst_uc3.cpp	Passing	Passing
<i>UC4</i>	tests/tst_uc4.h, tests/tst_uc4.cpp	Passing	Passing
<i>UC5</i>	tests/tst_uc5.h, tests/tst_uc5.cpp	Passing	Passing