Inhaler Cap Documentation

# Android Program

The Android device initially is paired with the inhaler cap it is going to use. After the initial setup, no pairing should be necessary and the device will connect automatically when in range. The Android code listens for messages that the inhaler cap sends, and stores the timestamp. Currently the cap may send multiple messages for one inhaler press so the device cannot be used for distinguishing each use of the inhaler but it can provide the general time it was used.

# Circuit Design

The circuit is assembled on a perforated printed circuit board. The circuit consists of a button, the ATtiny85 microcontroller, and the RN-42 Bluetooth module on the top, and the battery holder on the bottom. The button is connected to the microcontroller and triggers an interrupt when pressed. This wakes the microcontroller and sends a message to the RX pin on the Bluetooth module.

# RN-42 Bluetooth Module

The RN-42 is a class 2 Bluetooth module that contains the entire Bluetooth stack. The only pins used on the module for this application are the power, ground, and RX pins. When a character is sent to the RX pin using UART communication, it sends the data over Bluetooth to the connected Android device. The module also has a command mode where the configuration can be changed. For this application the baud rate is set to 2400 and some other various low power settings are configured.

# ATtiny85

The ATtiny85 is an Atmel 8-bit AVR RISC-based microcontroller. The microcontroller is programmed to sleep until an interrupt is triggered by the button press. It then sends a message to the RN-42 Bluetooth module using UART communication. The microcontroller doesn’t have a hardware UART module so it is simulated in software by using a standard UART library. Due to inaccuracies in the internal clock, the baud rate needs to be set to 2400.

# Battery

The battery used is a lithium ion coin cell battery, specifically a rechargeable CR2450. The battery rated for 3.6V at 110mAh. The circuit uses around 4mA of current so the device should last a full 24 hours before it needs to be recharged. Originally non rechargeable CR2450 were used to containing 600mAh but they quickly drop below 3V which is below the minimum spec for the RN-42 Bluetooth module.

# Case Design

The case is designed in Solidworks and is made of 3d printed plastic. It consists of a top part, an insert, and a bottom part. The top part is a hollow cylinder that has an opening at the top and bottom. The top opening is slightly smaller than the cylinder and insert in order to prevent it from falling out. The bottom opening has screw threads which are used to attach to the bottom part. The insert is a thin circle that sits inside the top half above the electronic circuit. The purpose of the insert is to provide a larger area that the user can push instead of trying to press the small button on the circuit. The bottom part is designed to have a tight fit on the top of an inhaler. There are screw threads on the outside which allow it to be attached to the top half of the case.