

UNIVERSITY OF CALGARY

ENEL 300

Electrical Engineering Design

Final Technical Report

Group LC4-B

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1) Introduction

Our device, AID2GO is designed for the elderly, patients of neurological diseases who may suffer from memory loss, and individuals who often forget to take their medications, important vitamins, or even doctor's appointments on a regular basis. AID2GO is a simple, user-friendly alarm-type device that will help remind the users of these activities. Once programmed by a medical professional, a family member, or even by the user themselves, the device can be used to store over 99 different tasks and events. This device was designed and built as a project for ILS (Integrated Learning Stream) which takes the knowledge gained from all five technical courses from winter semester (2022) to create the components which make up the final product.

This report is the final documentation that defines every aspect of the Aid2Go device, starting from the different components contained in the device's technical requirements, user instructions in the manual and down to the last detail regarding intellectual property (IP).

2) Product and Users

Old people tend to forget a lot of things, taking their medication and vitamins daily, doctor's appointments, and sometimes even regular checkups at the hospital, and having to set different alarms on a smartphone can equally be as tasking and even more difficult than remembering these different events. So, we created AID2GO, a portable and user-friendly alarm clock with a very simple interface that ensures that these events are completed by the user.

Our users will be someone who has trouble or difficulty remembering tasks and events pertaining to their health. While normally we would assume that an elderly person would be a perfect match for this, but we did not limit ourselves, but rather we can assume that the device can be used by anyone at all who requires an easy-to-use portable alarm that will be effective in helping them remember these tasks they tend to forget to do. The device can be used by anyone at all, even those with certain disabilities as it provides a very reliable audio and visual system that helps remind the patient of their day-to-day tasks.

With the knowledge gained from the use of an AVR microcontroller, we were able to use C code in the MPLab software to create a 1Hz clock for a 1-second signal leading to an amplifier for gain and speaker for audio output and pseudocode on how the LCD screen operates. Also using knowledge of filters and amplifiers, we were able to implement a soft sound that indicates the occurrence of an event. AID2GO is just as simple externally just as it is internally, there 4 input pushbuttons that will be used for user feedback and can also be used to scroll up and scroll down through the time settings, a confirmation button to process commands, and stop the alarm after it rings, and a menu switch from the main menu showcasing current time, and second menu allowing for the alarm to be set.

The entire internal circuit will be housed in a PLA filament casing which has a small hook/clip at the back for easy attachment to the clothing or bag worn by the user.

2.1) Persona

Intended User Persona -

Jobs to be Done:

What task performance is supported by this product?

Our product supports everyday tasks such as waking up on time, taking medications, reaching appointments – it helps the user to remember deadlines and making sure they complete whatever task it is they need help getting started with.

What are the goals?

Our product goals are to alert the user that their task is coming up soon, and they should get started with completing the task. It acts as a “portable alarm clock,” which also displays time, and the type of alarm. It will remind the patient of what they need to do throughout the day. Our patient’s goals are to complete the task.

Why does it make sense?

Our product makes sense because on average, people report forgetting daily tasks around the age of 50 years old – making our demographic quite large, and the use of alarms to be helpful. On a typical basis, most people use their cell phones to set these alarms, however, our device targets elders who are not as technologically adept, live alone, cannot keep track of their cell phones, and would simply like an easily portable alarm that tags onto their clothing throughout the day. Our product would provide access to loved ones, physicians, and the user themselves to pre-set alarms through our interface/code. It is also more user-friendly than normal alarms, as the types of alarms will be color-coded as per categorization, easy to carry around throughout their day, and change battery sources.

Use Cases:

How is this product used? Where is it used, and by whom is it used?

This product will be used to assist the elderly in keeping track of their medication, appointments, and other important medical-related things throughout the day. Our product works by allowing the user to pre-set their alarms either through us – pre-purchase alarm timings, or by themselves with push buttons to set the alarm using a time display. Once the alarm has been set, the device returns to displaying the current time of the day and rings every time the set alarm times match the current times. The time display will also display a unique message according to the categorization of the alarm set – for example, medication vs. appointment. The alarm will keep ringing until the user presses a push button to “turn off” the alarm, indicating they have received the alarm and remember to do the task now. The current time display flashes back onto its original menu and continues normally until another alarm rings.

There is no fixed location for this product as it is easily portable and is meant to be carried around with the patient throughout the day. We want the users to have a reminder system continuously, no matter where they are – it helps with finishing tasks. There will be a hook in the back of our casing that clings to clothing. Since our demographic is elders, they may stay in their home or neighborhood area for most of the day, so that may be the set premises of our device. However, this does not change the fact that the patient can go anywhere they want with our device.

This product is used by our target demographic – elderly people, or in general, people who tend to forget important things in their daily schedule. It is primarily used for that purpose; however, others can help with the set-up of the device.

How does the customer obtain information?

We were planning to advertise this product to physicians first, because they have more direct contact with elders who may require this product, and secondly, through TV advertisements and online posters where one can view/see the E-shop. The customer can also obtain information about our product through friends and family if they have purchased it. In terms of specifications and details regarding our product, our website will be the primary place where users can go to.

What does the purchase process look like?

According to our sustainability plans, our product will be sold through an E-shop to reduce environmental waste. Customers, their loved ones, or physicians can order the intended user our product through that website and receive their parcel through mail. The purchase process will look like how an individual would normally shop for items online – through a selection and check-out page that also provides our product specifications. These devices can be pre-set into code if the user wants to fill out a basic alarm information sheet, or also set at home after shipping using the device buttons.

Who influences the decision?

The decision to purchase our device can be influenced by multiple factors – i.e.: worried loved ones who want to provide the user with this device to help with daily tasks, the user themselves by noticing how they are forgetting things through the day, or through product recommendations by people facing similar problems. Considering our demographic specifically, we as designers can also influence our user's choice to purchase the product by:

- 1) Addressing cultural factors leading to the purchase. For example, people have a higher chance of buying something with helpful reviews – so we could incorporate physician recommendations and past user feedback into our design and have website posts. (Ethos method – gaining credibility).
- 2) Addressing physiological factors leading to the purchase. For example, people purchase things to fulfil a certain need – and our product assists people in fulfilling all types of tasks throughout the day. Helping someone feel self-reliant high targets the emotional aspect of purchasing something (Pathos method).

Gains:

To what extent do the products make the customer happy?

This product would make the customer happy to quite an extent because it allows our demographic to have a sense of self-independence because as an individual gets older, past the age of 60, they tend to rely more so on people around them to get around to daily tasks. Being able to cross something off the day's to-do list is bound to give an individual a sense of accomplishment. Our product assists the patient in doing these everyday tasks and provides a relief that something will be there to remind them of these tasks.

Pains:

What causes a bad feeling in the customer with the current product?

A user might have a bad feeling initially because they require such a device in the first place to complete daily tasks that others find easier. It might be frustrating to wear the device all day long, and it would be an extra object that the users will have to look after.

What are the worries of the user?

A user might worry that they cannot set the alarm by themselves (not as technologically adept), or they might lose/forget the device somewhere.

Persona Map –

Empathy Map

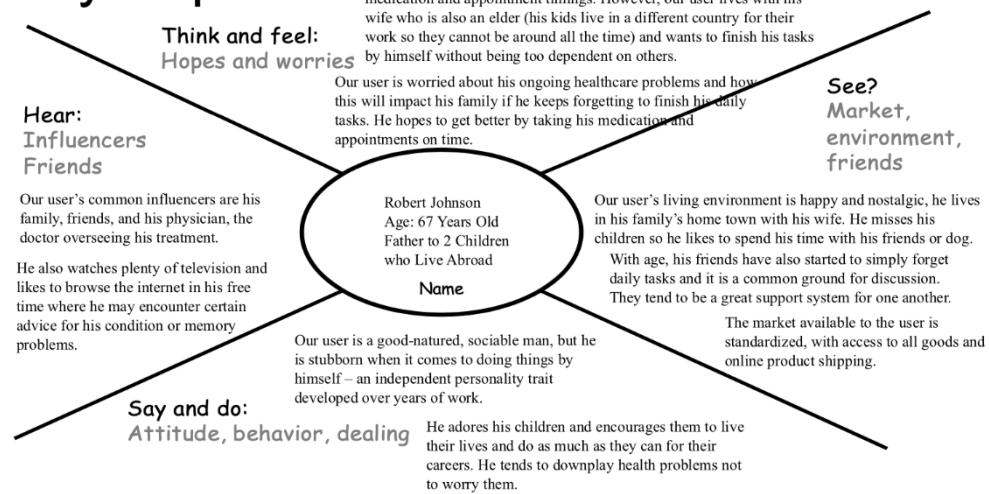


Figure 2.1 Initial Empathy Map for First Intended User

2.1.1) User Testing

User Feedback (Implemented within Project Design) -

Date:	Topic:	Feedback:	Implementation:
February 7 th , 2022	Project Casing	To help portability, the device can be clipped onto clothing or backpacks. This leaves the user carefree with where they're headed or what they'll be doing, instead of fretting about where the device is.	Aid2Go has an updated casing with a clip on the rear end to hook onto clothing or backpacks. This allows easier mobility for users.
March 13 th , 2022	Demographic	Aid2Go is a device that is useful to multiple demographics. For example, memory loss or being forgetful is not limited to the elderly. A wider market	Aid2Go will increase the intended demographic after initial sales in the future.

		base might be helpful during future work or implementation.	(See future work for reference and further information).
April 2 nd , 2022	Speaker Tune	One long frequency is hard to hear constantly. Alarms typically have a tune with varying frequencies to alert the user and be pleasant to the ears.	Aid2Go now has a melody with varying frequencies that repeats and sounds better to hear. (Chosen piano notes frequencies which are softer and smooth toned).

User Testimonials and Stories -

Name: Elizabeth Brown Age: 57

I am getting so old; I keep forgetting to take my medication. I visited the physician last week though, he told me that there is a new product - Aid2Go that all the seniors like me are using to help remind them of things. *Thank God for Alma*, my physician was able to order it for me from an online store called "Amazon." An old lady like me would never have been able to use these new computer devices, talk less about shopping online. I got my parcel in the mail today. I open the package, see a bright red ON switch, and press the switch on. *Thank God it is so easy to use, nothing like those silly iPhones*. The device boots up and asks me a few questions, I try to answer and tell it my medication schedule. *I really hope this works*. I clip it onto my sweater so I can always keep it with me. The next day I wake up, right after breakfast, I hear the familiar alarm from the device reminding me to take my medication. *Amazing is it not!* I have an alarm to constantly remind me to take my drugs on time and give me daily reminders to take a walk. *What a world we live in*. I cannot believe that this device will be there to help me wherever I go.

Name: Rachel Dareth Age: 34

I wake up to a pounding headache on the right side of my forehead, and a parched tongue. I had slept through the whole night and forgotten to take my medication. I sigh, knowing the following day was going to be rough with my fever, refusing to cool down. For the last few days, I have constantly been forgetting to take my pills on time with how busy my work schedule has gotten. *Remote work is no joke, I do not know why people think this lifestyle is easier than being in person*. I get up and take a temperature reading, and the small meter beeps a glaring red 38.7 degrees Celsius. When I used to live with my parents, they used to take care of me whenever I felt sick or needed extra care. I moved out last summer but cannot seem to remember the small things, such as waking up on time, taking my medication, or even eating lunch. *Even my cell phone does not work in reminding me since I always leave it on my desk or on the kitchen island. How I wish there were something I could carry around 24/7, like a clip to my jeans or shirt; it would make life so much easier*. I grab myself a bagel and turn on the TV, *I know, a healthy habit of watching dramas first thing in the morning*. There is an ad on the channel, some portable alarm device called Aid2Go. A woman has the palm-sized device clipped onto her jacket pocket as she carries it with her throughout her day. It rings aloud at precisely 12:00pm, indicating the time to take her insulin, before her lunchtime. *Huh, that looks useful and straightforward to use*. I searched the E-Shop site for the device and looked through the positive testimonials to make an order right away. *Wow, that was simple. I cannot wait to use this device*.

Value Proposition Canvas -

Value Proposition Canvas (PVC)

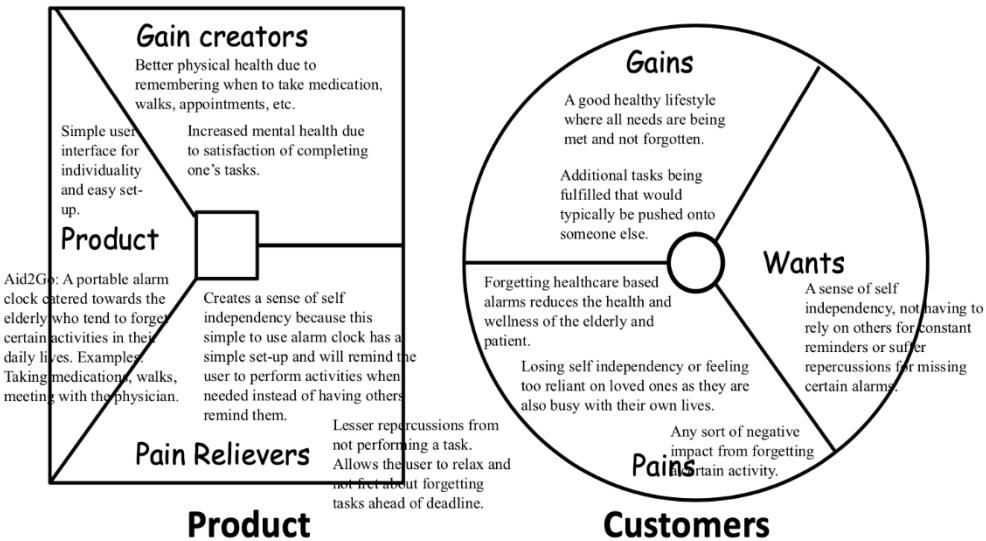


Figure 2.2 Aid2Go Value Proposition Canvas (In-Class)

2.2) Product

The product that our team has developed is a portable alarm system that is designed as a medical aid for senior citizens and other members of the populace who might require some assistance with their medical needs. AID2GO is designed to minimize the need for day-to-day micromanagement to reduce any hindrance in the user's lifestyle.

As specified, the target demographic for this product comprises senior citizens and other people who are undergoing some form of medical treatment. AID2GO has been designed to allow the user to set alarms, either by manually setting the exact time required via a set of input pushbuttons or by selecting a specific time from a range of pre-set alarm timings. Once the internal timer matches the set alarm timings, AID2GO will alert the user via a melodic tone played through the speaker installed at the top of the device, while simultaneously flashing a message across the LCD screen. The target demographic for this device often has slightly weaker senses and delayed reactions to stimuli. Therefore, AID2GO's audio-visual output was prepared to instantly catch the user's attention, since this device serves as a reminder to take life-saving medication.

Moreover, with the ability to program up to 99 different events using the LCD screen on the device itself, users can set reminders for numerous important events at a time, empowering users to keep meticulous track of all their appointments. The alarm system can also be programmed to set multiple alerts depending on the user's preference. To make the device more user-friendly, the alarm timings are saved to memory, to create a sort of a virtual medication planner, where the user can schedule when a certain medication

must be taken. The user does not need to reset the alarm each time it is triggered. In fact, if certain users are not as technologically adept, their family members or doctor can program AID2GO for them to ring at the specified timings, eliciting a response from the wearer.

Made with lightweight Polyterra PLA polymer, AID2GO was created to have a subtle footprint, to avoid the user from thinking about it as burden.

AID2GO was designed to be an ultra-portable device, which requires a minimal amount of maintenance. It is a compact module, with a provision for rechargeable batteries, to stop AID2GO from restricting the user's mobility in any manner.

All these provisions have been created to allow the users of this device to go about their daily lives with a greater sense of independence, making them more self-reliant in everyday tasks. We at Project AID2GO believe in providing equal opportunities to each one of our customers, discouraging them from being reliant on others for their day-to-day needs. We strive to make the lives of our customers easier.

The product that our team has developed is a portable alarm system which is designed as a medical aid for senior citizens and other members of the populace who might require some assistance with their medical needs. AID2GO is designed to minimize the need for day-to-day micromanagement

2.3) Product Change Log

Sprint:	Before Change:	Implemented Change:
Sprint 1:	We were going to have a multi-functional password and alarm memory space.	We have changed our product's functionality from being able to remember stored passwords and alarms to a simpler design of a portable alarm clock.
Sprint 2:	We were going to have different appearances for the final prototype. (Design progression shown below).	We have changed our product's appearance and casing to allow easy portability; a smaller, rectangular device instead of being an unaesthetic, and disorderly shape.
Sprint 3/4:	We were going to order a microphone for speech to text input commands from the user. This was not feasible in the C program space or with the microcontroller functional capacity.	We have changed our user interface, attempting to make user and device communication most effective and simple for the elderly or people who are not adept with electronics to use. First, we were planning to use a microphone for speech to text conversion via translation through the Google speech feature, however, our final prototype will use push buttons and a 4-digit 7-segment BCD LED screen.
Sprint 3/4:	We were going to order a 4-digit 7-segment BCD LED screen as our user interface and needed code to convert a binary clock signal to turn	We have changed our user interface from using a 4-digit 7-segment BCD LED screen to now using a 1602 LCD screen to make device coding simpler. A BCD conversion table was difficult to implement with current student knowledge, hence, the team opted for an LCD screen with a display for alarm

	on certain LED segments for appropriate number display.	messages and numbers. This eliminated the BCD conversion table or a BCD decoder entirely and allowed for additional features such as different menus for the main display and alarm settings.
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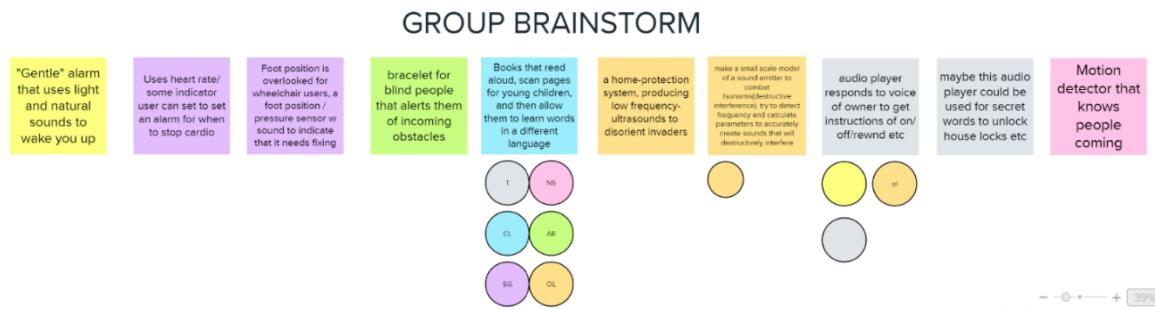


Figure 2.3 Sprint One Group Brainstorm for Device Functionality

Initially, we combined two ideas from the ILS group brainstorm; an alarm clock with audio function and a device that stores passwords to unlock accounts.

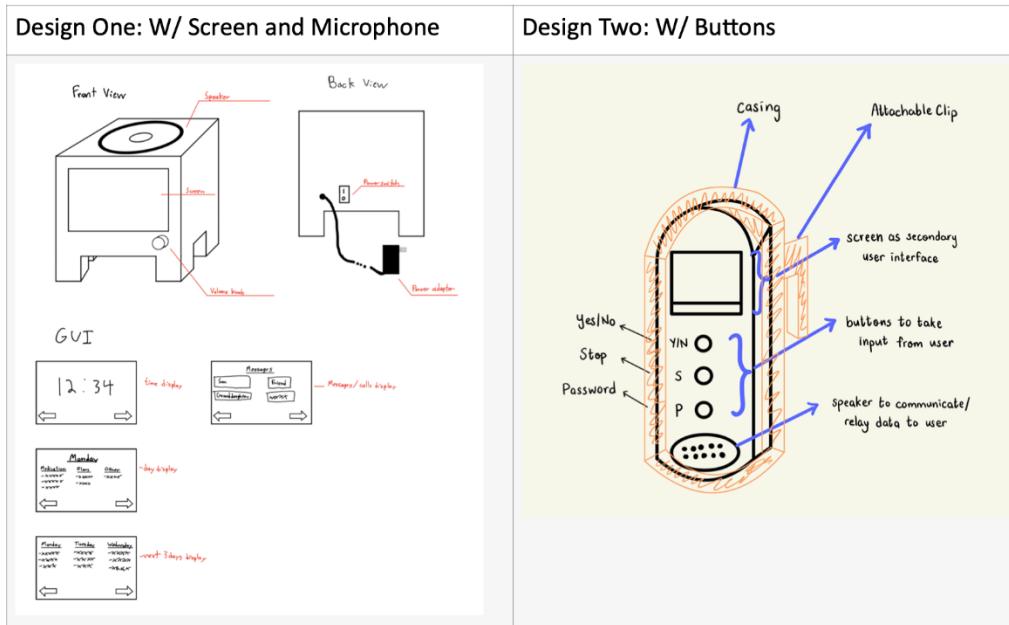


Figure 2.4 Sprint One Casing Designs

Initially, we came up with two different prototypes for our idea, depending on what was feasible to build over the sprints.

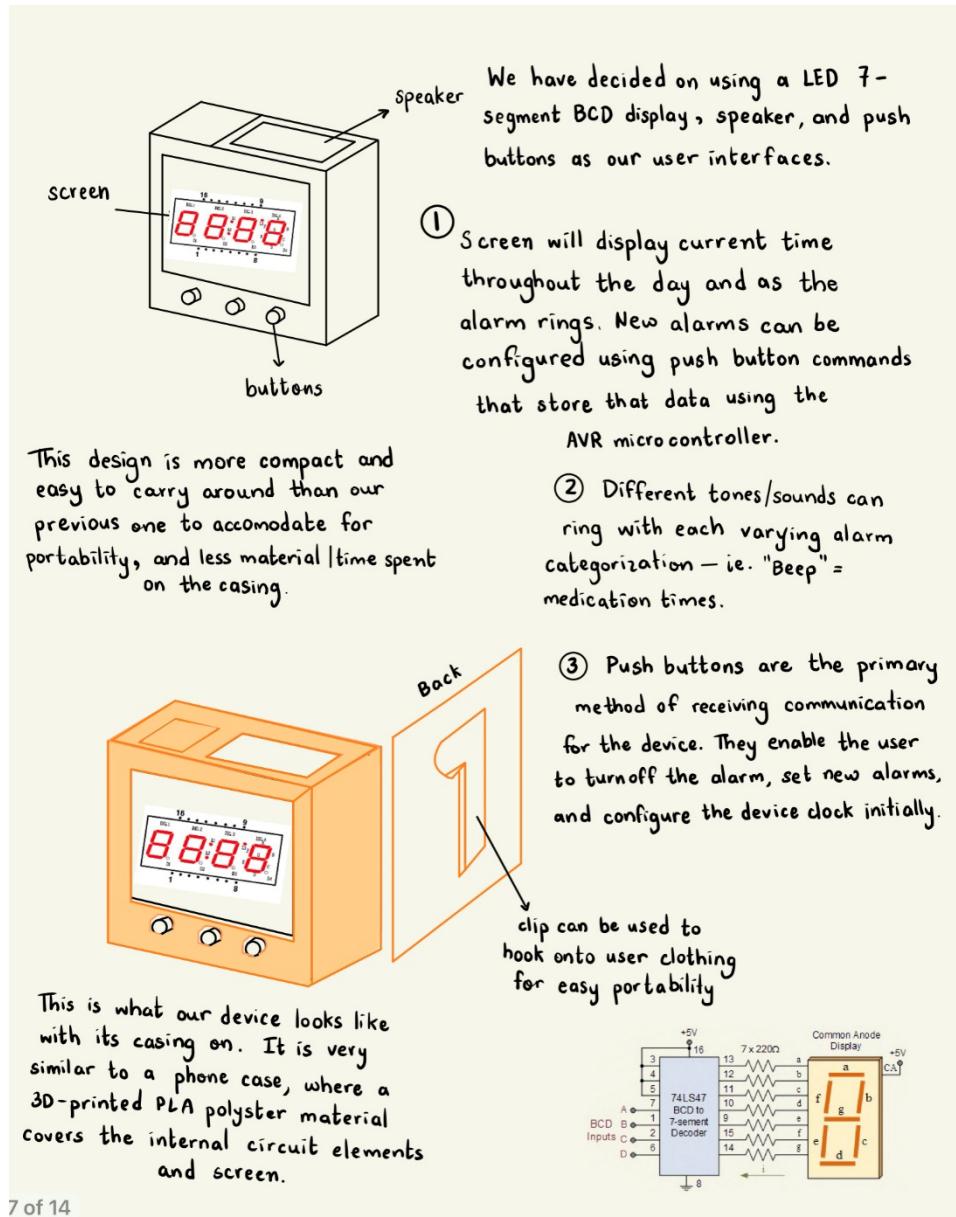


Figure 2.5 Sprint Two Casing Designs and User Implementation

We decided on a cubic casing with a clip-on back for the external design of our product. We also decided to progress with one functional idea for the device: a portable alarm clock. There was uncertainty about the user interface hence we decided to come up with 3 different device/user communication methods.

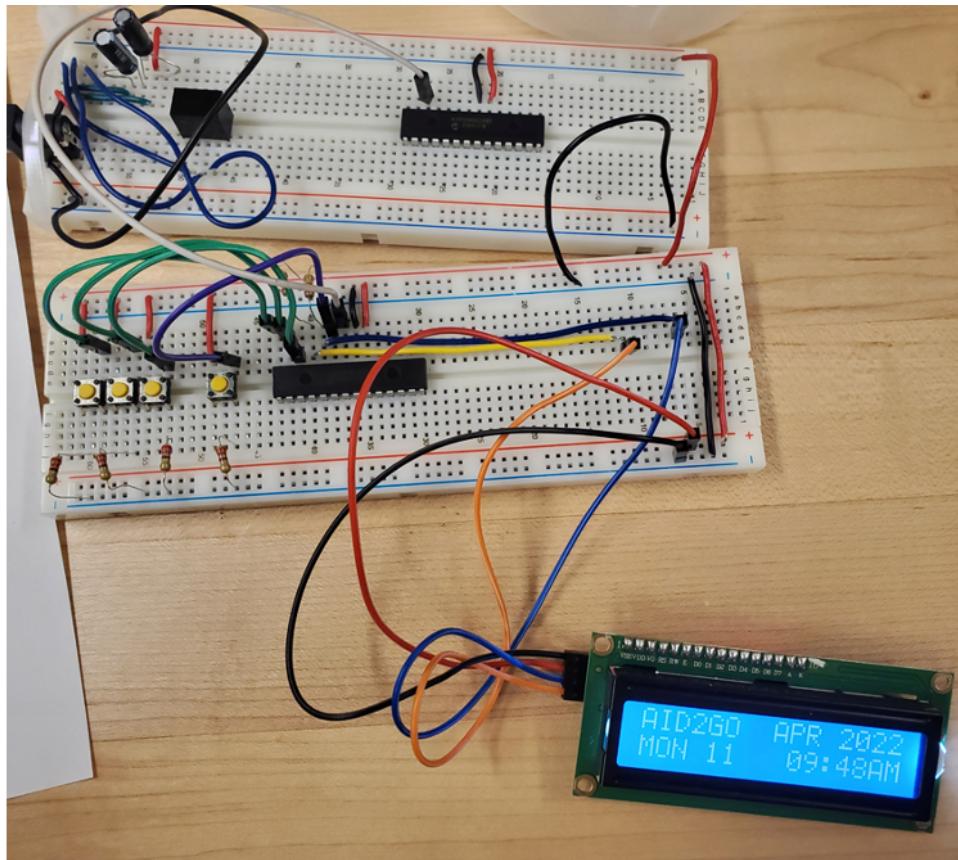


Figure 2.6 Sprint Four Technical Workings of User Interfaces

We have decided on using push buttons to receive information from the user such as scrolling up, down, confirming selection of commands, and menu switch. Furthermore, we will be ordering a 1602 LCD screen to eliminate having to implement a BCD conversion table or purchase a BCD decoder to showcase time in our main or alarm display.

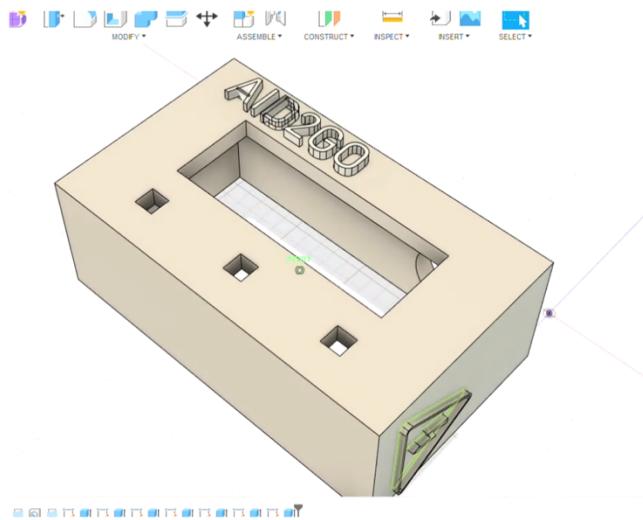


Figure 2.7 Sprint Four Final Casing Design on AutoCAD

This is our final external casing for the device which will be 3-D printed with PLA filament (in accordance with our sustainability plans) and will cover and protect the internal circuit elements.

3) Technical Description

Overview:

This Technical Description will cover:

- The Circuitry of the AID2GO
- The Programming of the AVR Chips within the AID2GO
- The Functionality of the Overall AID2GO System

3.1) Technical Description

3.1.1 Circuitry:

The AID2GO internal Circuitry can be broken down into 4 main components that will be covered in this order:

- Power Supply
- 1Hz Source
- Core (AVR/Screen/Buttons)
- Speaker and Amplifier

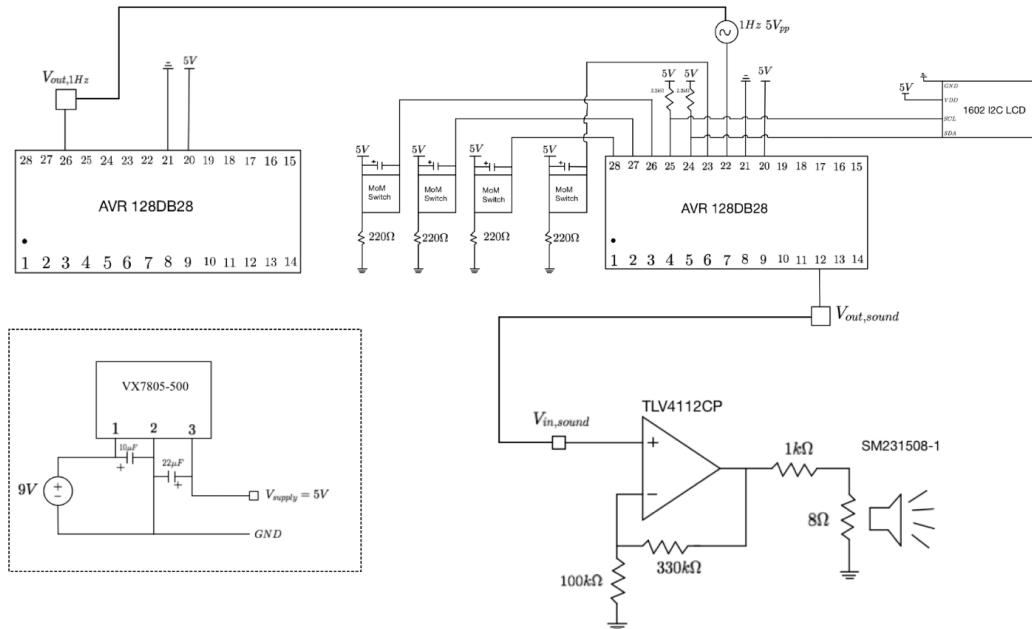


Fig 3.1 Total Circuit Diagram

Total Component List:

*Note, further breakdown and component sources are listed after in the individual module breakdowns

- AVR128DB28 x2
- SunFounder IIC/I2C/TWI 1602 Serial LCD Module Display
- SM231508-1 Speaker
- VX7805-500 5 V, 500 mA regulator
- MoM Switch x4
- 10uF Capacitor
- 22uF Capacitor
- 100nF Capacitor x4
- 220 Ω Resistor x4
- 2.2k Ω Resistor x2
- 100k Ω Resistor
- 330k Ω Resistor
- 1k Ω Resistor

Power Supply

The power supply utilizes a 9V battery along with a 5V regulator to ensure that both AVR chips, LCD Display, and TLV4112CP Op-amp receive adequate power that cannot spike above operating voltages.

Components Used:

- VX7805-500 5 V, 500 mA regulator (<https://www.digikey.ca/en/products/detail/cui-inc/VX7805-500/7350283>)
- 10uF Capacitor
- 22uF Capacitor

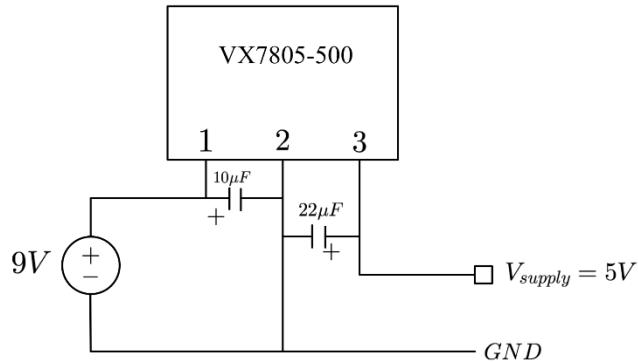


Figure 3.2 Power Supply Diagram

1Hz Source

The 1Hz source was created using an AVR running custom C code. While it may have been more efficient to use a dedicated 1Hz crystal oscillator (or similar device), the capability to adjust the frequency of the source for testing and debugging purposes proved invaluable. This system leaves some room for improvement, but the output wave is exactly a 1Hz 5Vp-p square wave that meets the required criteria for the core of the AID2GO real-time-clock applications.

The AVR chip in this circuit runs the code within ‘300-CLOCK.X’ with its main as ‘newavr-main.c’

Component List:

- AVR128DB28 (<https://www.digikey.ca/en/products/detail/AVR128DB28-E%2fSP/150-AVR128DB28-E%2fSP-ND/12807273>)

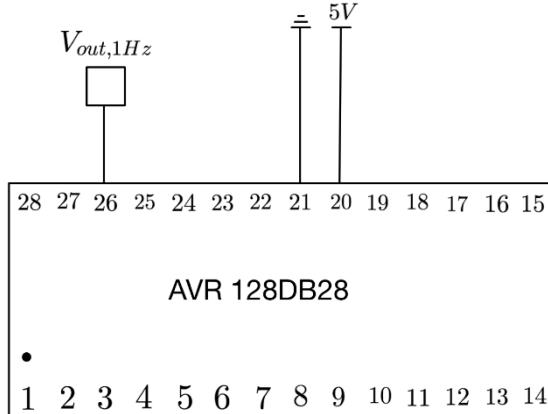


Figure 3.3 1Hz source Diagram

Core

The AID2GO ‘Core’ is the main electronic circuit defining the functionality of the AID2GO, and is what relates all components to each other.

- It utilizes the Power Supply to power the AVR
- It utilizes the 1Hz source to power the real-time-clock functionality
 - o An internal counter is triggered on the rising edge of this source
- There are 4 buttons that interface with this chip that utilize interrupts when the input pins are set to high
 - o The capacitors attached to these buttons help smooth them to avoid ‘bouncing’
- The on-board DAC is used to send sound signals to the TLV4112CP Op-amp which then drives the speaker

The AVR chip in this circuit runs the code within ‘300.X’ with its main as ‘newavr-main.c’

Component List:

- AVR128DB28 (<https://www.digikey.ca/en/products/detail/AVR128DB28-E%2fSP/150-AVR128DB28-E%2fSP-ND/12807273>)
- SunFounder IIC/I2C/TWI 1602 Serial LCD Module Display (https://www.amazon.ca/gp/product/B019K5X53O/ref=ppx_yo_dt_b_asin_title_o00_s00?ie=UTF8&th=1)
- MoM Switch (<https://www.digikey.ca/en/products/detail/KSA0M411+LFTR/CKN10731-ND/5975547>) x4
- 220Ohm Resistor x4
- 2.2k Ohm Resistor x2
- 100nF Capacitor x4

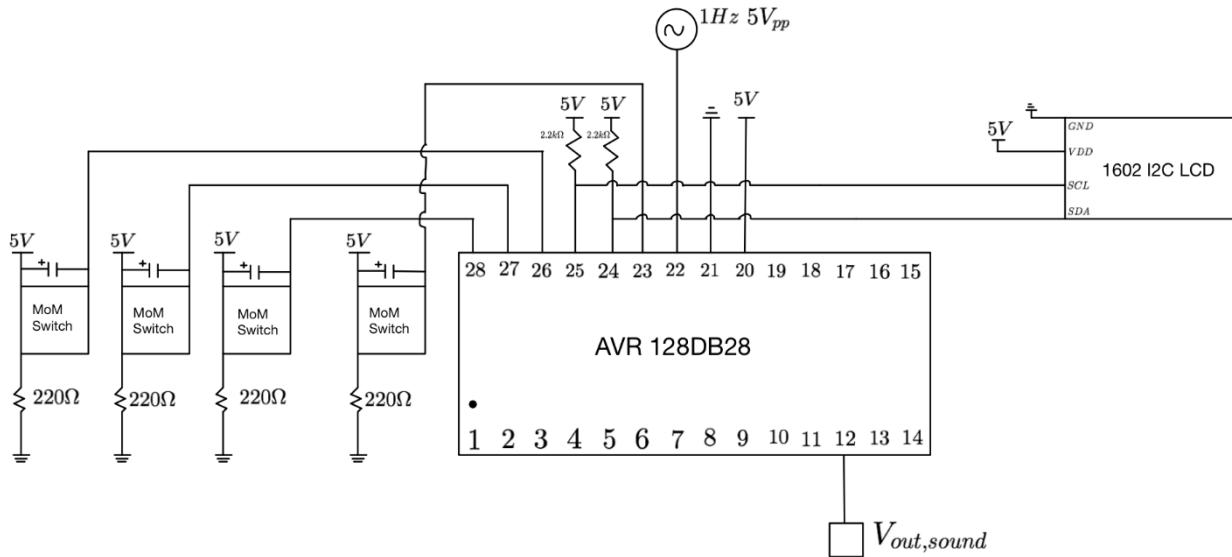


Figure 3.4 Core Diagram

Speaker and Amplifier

The speaker and amplifier circuit does not utilize any high pass or low pass filters as it only plays 6 distinct frequencies, and in testing, did not seem to experience a noticeable amount of noise. Forgoing these filters allows us to save on more space, which in a portable device, is an area of concern.

Component List:

- TLV4112 Op-amp (<https://www.digikey.ca/en/products/detail/TLV4112CP/296-10716-5-ND/382110>)
- SM231508-1 Speaker (<https://www.digikey.ca/en/products/detail/SM231508-1/2104-SM231508-1-ND/9990601>)
- 100k Ohm Resistor
- 330k Ohm Resistor
- 1k Ohm Resistor

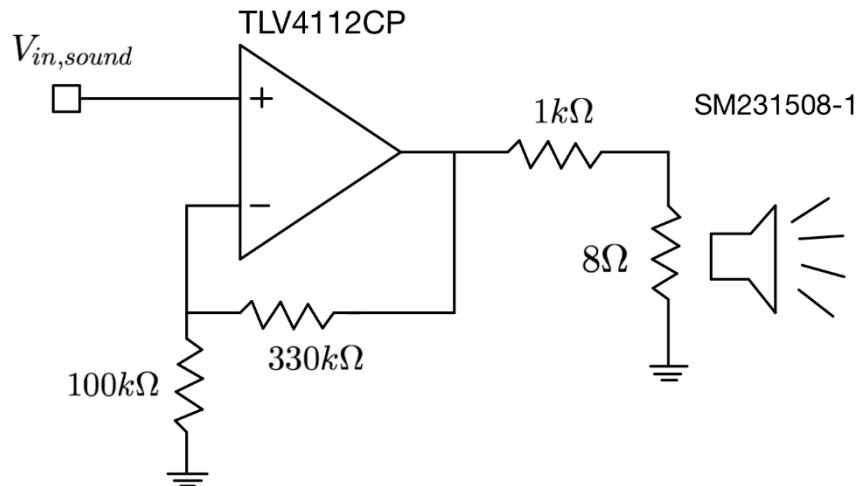


Figure 3.5 Speaker and Amplifier Diagram

3.1.2 Software:

To create the software used in the AID2GO, the MPLABX IDE was used. All code was written in the C programming language using the XC8 compiler and programmed to the AVR chips using the ‘PicKit4’ device.

There are 2 sets of software used for the AID2GO:

- Timer Software (300-CLOCK.X), ran on the 1Hz timer circuit
- AID2GO Operating System (300.X), ran on the ‘Core’ circuit

All code not written by AID2GO Developers will have the author listed. Otherwise, the author is listed within code comments.

(Code is provided within zip file in .c and .h types for further analyses).

300-CLOCK.X Overview

Contents:

- newavr-main.c
 - o Outputs a 1Hz square wave

300.X Overview

Contents:

- newavr-main.c
 - o OS initialization (speaker, LCD screen, other variables)
 - o Runtime checks for button presses, 1Hz signal, user alerts
- bUtils.c/bUtils.h
 - o Contains various tools used internally

- button.c/button.h
 - o Implements button functionality for any given mode
 - o Does **not** test for button presses, that is done by ‘newavr-main.c’
- i2c_lcd.c/i2c_lcd.h [Author](#)
 - o [LCD Interfacing](#)
- menu.c/menu.h
 - o Responsible for displaying all menus and screens
- reoccurring.c/reoccurring.h
 - o Handles/stores user events
- twi_master.c/twi_master.h [Author](#)
 - o [LCD Interfacing](#)
- watch.c/watch.h
 - o Counts real time
 - o Overflow proof, the only value that cannot be overflowed is the year. The clock runs on a ‘reset’ style system. Ex: Once 60 seconds are counted, the counter resets back to 0
 - o Has functions for modifying time
 - o Cannot enter invalid time (61 minutes, 15 months, etc)
 - o Accounts for leap years

3.1.3 Functionality:

Buttons:

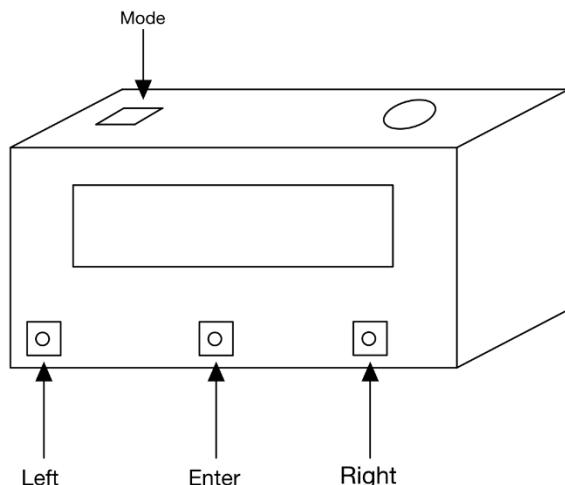


Figure 3.6 Button Diagram

- Mode
 - o Used to integrate through menus (except the alert menu)
- Right
 - o Used for navigation through menus
- Left
 - o Used for navigation through menus
- Enter

- Used to confirm settings, acknowledge an alert

Modes

The AID2GO has 5 modes:

- Alert Mode
- Debug Mode (disabled on production models)
- Main Menu
- Time Set Mode
- Alert Set Mode

Debug Mode:

While disabled on production models, the debug mode only displays values (which may vary depending on the version of code that the product is running.) Pressing the **mode** button will change the device to the ‘Main Menu’

Alert Mode:

The device enters this mode when the user has received an alert. When this mode is active, the device will play a tune through the speaker to also notify the user. This mode displays:

- The kind of alert (Doctor, medicine, general alert)
- The time that the alert happened
- Alert number (1-99)

Alert mode will persist until the user presses the **enter** button. Upon pressing, the AID2GO will proceed to the main menu. All other buttons have no effect in this menu.

Main Menu:

The main menu displays:

- “AID2GO”
- Current time (12Hr clock), date, and day of the week

There is no button functionality in the main menu other than the **mode** button. Pressing this button will change the device into ‘Time Set Mode.’

Time Set Mode:

The ‘time set mode’ allows the user to change the current year, month, date, hour, and minute. Times are entered in a 24h clock (which is automatically adjusted to 12h when viewing the main menu), and the device does not allow invalid inputs to be entered. This menu will display what value you are setting (day, year, etc), as well as what you are setting it to (2022, 04, etc). To **toggle the value**, press the ‘**enter**’ button. To **adjust the value**, use the ‘**left/right**’ keys. When time adjustments are finished, use the ‘**mode**’ button to advance to the ‘Alert Set Mode.’

Alert Set Mode:

In this mode, the user can set the properties of an alert, including whether it is enabled or disabled. The device has space for 99 alerts. The properties of an alert are:

- Alert Number (0-99)
- Day of week (Sun-Sat)
- Hour
- Minute
- Type (Doctor, Medicine, General Alert)
- Enable (ON/OFF)

To edit an alert:

- Use the **left/right** buttons to scroll to an alert number
- Press **enter** to scroll through alert properties (excluding the alert number)
- Press the **left/right** buttons to adjust the alert property

Pressing the **mode** button will change the device mode to ‘Main Menu.’

3.2) Sustainability

The sustainability of a product is necessary to portray and set a leading example for one’s business and its users to value individual impact on surrounding communities and the environment. The team sought to address environmental and social issues our product could possibly entail with an innovative and ethical manner. We were sure to incorporate sustainability plans in our product’s design and concept, material, production, logistics and retail, user practice, and recovery aspects (all of which are listed below). Our main goals were to reduce excess carbon emissions and create a recyclable product, and finally, increasing the usability of our product by making it multi-functional.

Design and Concept:

The product, being a portable alarm clock, allows for informal alteration and modification. While users will not be able to physically alter the device, they will be able to adjust settings and import their schedules and other tasks into it. Through the audio and physical interface, we plan to use, users can adjust the functionality of the device. This may be a somewhat challenging process for the elderly who may not be fluent with technology, however, family members or friends can also help with initial device setup. The device can also be configured to a patient’s portfolio and doctor recommendations through our E-Shop or online customer service.

Materials:

The product will make use of environmentally friendly materials such as Polyterra PLA polyester to 3-D print our device casing and outer layer. Upon research, our team has confirmed that renewable resources are used in the production of PLA (corn and other biodegradable components which are compostable and turn into mineral salts to support plant growth). The device can also operate on rechargeable batteries to prevent any toxic chemicals from the alkaline cells entering the waste facilities or the environment.

Production:

We have designed our product for simple disassembly. The battery compartment will be accessible from the rear end of the casing, and it will not require any extra tools. However, access to the device's internal circuit will be restricted with screws as to discourage accidental tinkering or breakage.

Production will also be limited to the number of orders we receive through our E-Shop to prevent excess waste of resources and materials. The product shipment is also ethical in terms of costs and room for travel due to its lightweight packaging and sizing proportions. Small parcel shipping for new businesses has also been proven beneficial for the environmental, easy tracking of parcels, and cheaper than freight shipping larger batches.

Logistics and Retail:

The product will be available for purchase through an E-Shop. The demographic our product is targeting are the elderly, and patients that doctors recommend our device to help keep track of their appointments, and medications. While starting the product off, it would be a waste to mass produce or start up a shop/consider shipping cost and environmental pollution. The E-Shop would be accessible to everyone, but provides special access to doctors and their patients, so the devices can be configured to a patient's portfolio and doctor recommendations.

User Practice:

Our selling point to users will be through embedded storytelling, also increasing the usability of our product by building an emotional connection with our demographic. It is important to help bring forth how our product helps in a user's day to day lifestyle and self-independency. We can ask for product reviews and feedback to place on our E-Shop site as well. As users relate to our user stories because they are in a similar, difficult situation and experience the positive change our device makes; they will continue using the product and promote it to others as well.

We have increased usability of our product by increasing its multi-functionality. The product has a primary use for alerting our user at specific times for specific purposes, very similar to an alarm, watch, or clock. There are a few extra features such as easy navigation, portability of the device, clip-on casing, internal clock settings accounting for leap years, and a total of 99 different alarms with automated messages. The user can also set extra times/alarms for themselves, besides health-based usage.

Recovery:

Since our product will be rather small with an intricate design and delicate parts, we will offer a warranty with our product rather than specifically focus on user repair. However, we will still allow for easily swappable batteries should users start to experience lowered maximum battery life. Nonetheless, our circuit board will be easily accessible to allow repairs from third party vendors.

Maintenance of our device is straightforward as users will be provided with a set of basic guidelines in relation to using electronics, such as battery life and exchange, and keeping the casing on to always protect internal circuitry. These instructions will be viewable on our E-shop website to prevent paper waste and losing the pamphlet eventually, while the battery type can be indicated by engraving a small symbol on the casing itself.

3.3) Intellectual Property

Description: This device generally relates to alarm clock, particularly to medication timers.

Background: this device is a low-cost portable medication timer, which can be used to set alarms to alert users to take their medication and can be programmed to alert the user to important upcoming appointments.

Claims:

- an alarm clock system for senior citizens and people undergoing medical treatment
 - o Uses an AVR microcontroller-based circuit to keep time and store alarm timings
 - o Alarm timings can be set using multiple push buttons
 - o Speaker to generate a tone when alarm is triggered
 - o An LCD output screen to showcase the current time and date and flash a message when an alarm is triggered
- Compact form factor
 - o Device can be attached to the user's lapel using a hook
 - o the AVR circuit mentioned in the previous claim is powered by a 4.5V battery pack comprising of a set 1.5V rechargeable cells.
- Uses a 1Hz source to keep time

To: The Registrar of Trademarks

Gatineau, Quebec.

1. The applicant, **LC4B**, the full post office address of whose principal office or place of business is **ENG130** applies for the registration, in accordance with the provisions of the Trade-marks Act, of the trademark identified below.

2. The trademark is **AID2GO**.

3. The trademark has been used in Canada by the applicant (or his predecessor(s) in title (d). **nil**) in association with all the specific goods listed hereafter, and the applicant requests registration in respect of such goods. The trademark has been so used in Canada in association with the general class of goods comprising the following specific goods (e). **nil**. since (f)...**nil** and in association with the general class of goods comprising the following specific goods (g)..... since (h).....(j).

(Upon research we could not find a previous trademark of the name AID2GO)

4. The applicant is satisfied that he is entitled to use the trademark in Canada in association with the **goods** described above.

4) Teamwork and Agile Project Management

Through the process of designing and building our final product and its physical prototype, our team has learned just how important working together was to meet all necessary external deadlines with quality work. Some characteristics our team embraced to ensure our best performance were effective communication methods, distributing workload based on individual skills and time availability, and setting internal deadlines with smaller tasks to achieve with each sprint.

- We were sure to follow through with the teamwork contract we signed earlier in the semester, with key points being: Listening to everyone's ideas, making sure everyone is present and participating equally, and delegating tasks according to team member's strengths and skills.
- We were successful in collaborating with one another which is portrayed by our functional final product. A reason why we could accomplish our deadlines and goals was because of how we split our work in the beginning of each sprint and gave constant updates on our individual progress on the shared group chat. The constant updates allowed each team member to provide their input and feedback to every participant and project part. With this, individuals also had a sense of interdependency and responsibility as the final product relied on everyone's unique effort.

Agile Project Management also stood out to be a useful tool in managing larger projects while applying constant feedback and changes over the completion period and ultimately, saving time. Undergoing an entrepreneurial approach to designing the electrical device and building a physical prototype, it was utmost necessary that we were able to alter the designs leading to building our final product to ensure product owner satisfaction and user functionality. Initially, the group had limited knowledge of how to implement our ideas and the feasibility of our product, leading to stages of time where certain circuit components were halted. If everything depended on the completion of one another, our group could not have begun work till the last quarter of the given time. This would have led to a concerning situation. However, agile project management allowed us to work on isolated circuits, codes, designs, and reports, which received professional reviews and remarks for improvement. The one biggest take away from this course would be how the agile design process works and how it is more efficient for building a faster design and gaining feedback from investors and customers. An iterative process allowed our group to continuously build on the project by working on small portions, so the output is not dependent on finishing one step at a time and redoing everything if there was an error.

- We were sure to document this agile project development over time as well, allowing us to see the growth of our product with different change logs. There has been visible progress over the last few months leading to the final product and this information holds significant value to product owners, users and developers for future work or further alterations.

5) Future Work

We have two major implementations for future work with Aid2Go's final prototype. We would be making these two changes in addition to the current device, meaning more available features. These two changes encompass social and design factors for further improvement by increasing multi-functionality.

- 1) This amendment was feedback received from user testing in the early phases of designing Aid2Go. Currently, the user demographic is limited to the elderly and patients with memory loss,

which narrows down our intended users by quite a margin. Upon successful sales, this device can also be used by working individuals who need to jot down their tasks for the day and younger people with memory loss or the inability to remember tasks throughout their daily lives. Our device, although branded towards the healthcare industry, can implement minor changes in the LCD alarm messages to ring for different sorts of people. This requires a change to the device code to increase the number and type of alarm message for alarm categorization.

- 2) An additional feature of Aid2Go was initially supposed to be password storage for people who cannot seem to remember or access help for accessing private accounts. Aid2Go would store passwords for each site in its memory by allocating a new and different menu in the LCD device code. To set a new password, an individual would follow similar steps to setting a new alarm. They would scroll through the menu button to the password screen, scroll up and down to select *store password* or *access password* settings, and the device would allow the user to perform their intended goal. Our device would have to implement an internal LCD keyboard to input password data and for any changes to password data, which is the following step after clicking upon *store password*. Once stored, access to the passwords would be a simple scroll through the data after clicking upon *access password*.

This feature increases the multi-functionality of the device because it is already targeted towards people with memory struggles in their daily lives. Forgetting passwords is a common occurrence in the daily lives of just about everyone – it can't be helped sometimes. Often, people tend to write the password somewhere unsafe for security purposes or on a random piece of paper they forget about and lose after some time. There is a multi-step process of retrieving your lost password and setting a new one which is not preferred in rush or without help. However, due to the portability of our device and simple user interface, it is a relatively easy procedure to login into accounts. This feature is complementary to our device's current functionality, which users would surely appreciate.

- 3) Recent user feedback has been often requesting the addition of a volume knob/adjustor on the Aid2Go device. Utilizing a simple potentiometer along with some adjustments to the outer casing of the Aid2Go could improve the user experience drastically, as the loudness of the speaker plays a role in the usability/enjoyability of the product. For example, elderly people tend to have hearing disabilities and need louder volumes to process sound and information while younger people can be alerted with quieter sounds. There should be a method to accommodate all ages in our user demographic. Hence, such an addition would greatly increase the user experience, without sacrificing too much of the overall cost.
- 4) This idea has already been implemented within our current final prototype of Aid2Go, however, we were not able to physically create a website for our E-Shop for customer orders and customization of the device as stated throughout the report. Future work with the website is a part of Aid2Go's sustainability plans as the online resource will hold any marketing brochures, user manuals, customer testimonials, and any other customer related feedback of information to reduce paper wastage. Hence, we will create a site for the Aid2Go device, and this will be shared through barcodes and links by physicians, friend groups, and short television advertisements.

6) References

(APA format)

- Dec 27 Written By, & By, W. (2021, February 26). *Is online shopping eco-friendly?* Polly Barks. Retrieved April 23, 2022, from <https://pollybarks.com/blog/is-online-shopping-eco-friendly>
- *Is Pla actually bio-degradable?* All3DP. (2021, September 14). Retrieved April 24, 2022, from <https://all3dp.com/2/is-pla-biodegradable-what-you-really-need-to-know/>
- Google. (n.d.). *US6229431B1 - medication reminder device.* Google Patents. Retrieved April 25, 2022, from <https://patents.google.com/patent/US6229431B1/en>
- Google. (n.d.). *US4905213A - medication reminder.* Google Patents. Retrieved April 25, 2022, from <https://patents.google.com/patent/US4905213>
- Google. (n.d.). *US5233571A - Medication Timer.* Google Patents. Retrieved April 25, 2022, from <https://patents.google.com/patent/US5233571A/en>

A) User Manual, Instructions

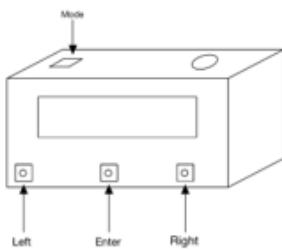
The Following User Manual/Quick Start Guide will be packaged with all AID2GO devices to assist with setup and basic operations. For an advanced technical guide, refer to **3.1.3 Functionality**.

AID2GO: User Manual/Quick Start Guide

Features:

- 16x2 LCD Display
- Speaker
- 4 Buttons for User Input
- Adjustable Time Settings
- Store up to 99 User Alerts
- Enable/Disable Alerts at any time
- 9V Power Supply

Button Reference:



Getting Started:

Once you receive your AID2GO, you first want to set the time and some alerts.

Your device will already be in the **Main Menu**



Press **enter**

Your device will now be in the **time set mode**

1

Figure A.1 Quick Start Guide Page 1



From here, you can use the **enter** button to change the value you are editing (year, month, etc.)



Use the **left/right** buttons to adjust this value. Once you are done setting the time, press the **mode** button to go to the **Alerts Menu**.



Use the **left/right** buttons to change the reoccurring event that you are editing.



When you are on the event you want to edit, press **enter** to begin changing the properties.



Make sure to set the **EN (enable)** value to **ON** if you want the alert to trigger.



When you are done, press the **Mode** button to return to the **Main Menu**.

Figure A.2 Quick Start Guide Page 2

Receiving Alerts:

When an alert is triggered, a screen displaying the amount of missed alerts, the type of alert, the alert number, and the time it was missed will be displayed. A tune will also play during this screen.



To “acknowledge” this alert, press the **enter** button, and the AID2GO will return to the main menu and stop playing the tune. You do **not** have to re-enable an alert after you clear it, it will repeat every week unless manually disabled in the menu.

Time Settings:

- Year (YYYY)
- Month (MM)
- Day (dd)
- Hour (hh) 24h set, 12h display)
- Minute (mm)

Reoccurring Alert Properties:

- Alert Number (0-99)
- Day of Week (Sun-Sat)
- Hour (hh, 24h)
- Minute(mm)
- Type (Alert, Doctor, Medicine)
- Enable (On/Off)

Having Troubles?

Call our support desk at (123) 456-7890 for advanced troubleshooting and general assistance.

3

Figure A.3 Quick Start Guide Page 3

B) Pitch: Marketing Brochure

The following marketing brochure will be used to address the user to persuade them of the product's usefulness and to make a purchase.

OUR BEST SERVICE

When ordering an Aid2Go device from our E-Shop, memory-loss related or elderly patients will have an option to add their physician's contact information to give them access to alarm settings for specifics such as medication or appointments.

The physician will be alerted with a daily report of each passing and compete scheduled event to address patient health upon later meetings.



SUSTAINABILITY PLANS

Alongside creating Aid2Go, our group was cautious about the sustainability efforts we put into the production of the device and processing of the orders. A good device is not only functional but also sustainable ethically, socially, and environmentally!

RESOURCES — Casing is constructed from compostable plant-based PLA filament with renewable battery sources.

E-SHOP — Ethical online market which has approximately 30% less carbon emissions and energy usage than traditional retailing.

SHIPMENT — Customized orders to better suit each user and reduced carbon footprint due to excess production and large batch travel.



BARCODE HERE TO OUR WEBSITE

THANK YOU.



LC4-B ILS FINAL PROJECT

AID2GO: THE PORTABLE ALARM CLOCK



Contact Information: (123)-(456)-(7890)
Please feel free to reach out if you have any questions or concerns.

Figure B.1 Aid2Go Marketing Brochure Page One



Figure B.2 Aid2Go Marketing Brochure Page Two

C) Intellectual Property

Accessible research from the following online resources ...

- Google. (n.d.). *US6229431B1 - medication reminder device*. Google Patents. Retrieved April 25, 2022, from <https://patents.google.com/patent/US6229431B1/en>
- Google. (n.d.). *US4905213A - medication reminder*. Google Patents. Retrieved April 25, 2022, from <https://patents.google.com/patent/US4905213>
- Google. (n.d.). *US5233571A - Medication Timer*. Google Patents. Retrieved April 25, 2022, from <https://patents.google.com/patent/US5233571A/en>

Final Report Work Distribution:

Solanki Nishi – Sections 2.1, 2.3, 3.2, 4, 5, 6, B

Klics Barret – Sections 3, 3.1, A, Table of Contents, Table of Figures

Lal Ojaswi – Section 2.2, 3.3, C

Akalumhe Tumi – Sections 1, 2

Final Project Work Distribution:

Solanki Nishi – Programming, circuit design, sprint reports

Klics Barret – Programming, circuit design, debugging, sprint reports

Lal Ojaswi - Research, casing, sprint reports

Akalumhe Tumi – Research, casing, sprint reports