

User Details

Serial Checker (SC0001)

“Captures the user oriented details of the project”

Rev B

10-JUL-2024

Purpose.....	1
Abbreviations.....	1
References.....	2
User Story.....	2
Context.....	2
Basic Wish.....	2
Concept Sketches.....	3
- Image 1: Hardware peripherals of the device.....	3
- Image 2: Examples of screens on device’s LCD.....	4
- Image 3: General flow of “windows” on screen.....	4
Use Cases.....	4
Selection Use Cases.....	4
Use Case #000: Serial Selection.....	4
Use Case #001: Sample Rate.....	4
Use Case #002: Sample Size.....	4
Use Case #003: Sample Trigger.....	4
Use Case #004: Response Trigger.....	4
Use Case #005: Serial Response.....	5
Use Case #006: Export Data.....	5
Use Case #007: Predetermined Options.....	5
Interface Use Cases.....	5
Use Case #008: Input Controls.....	5
Use Case #009: Visible Cursor.....	5
Use Case #010: Serial Selected.....	5
Use Case #011: GPIO Designation.....	5
Use Case #012: GPIO Live Value.....	5
Use Case #013: Analysis State.....	5
Use Case #014: Analyzed Data.....	5
Revision History.....	6

Purpose

The purpose of this document is to capture the user oriented details of the project (namely the user story and use cases). This document reflects the original (and developing) ideas on what the final product should be and do.

Abbreviations

<u>Abbreviation</u>	<u>Description</u>
GPIO	General Purpose Input Output- typically in reference to digital, bidirectional pins
UART	Universal Asynchronous Receiver Transmitter
I2C	Inter-Integrated Circuit
SPI	Serial Peripheral Interface

References

<u>Name</u>	<u>Document Number</u>
-	-

User Story

This section captures the raw “story” behind why the project exists to begin with (besides being a means to practice embedded firmware/product development skills).

Context

I have a personal project (Project RISCII) that involves designing a softcore microprocessor from scratch (core processing, peripherals, etc). This design includes various external peripherals connected to via GPIO pins. In detail, the microprocessor includes external ports to GPIO pins, UART pins, I2C master pins, and SPI master pins (i.e. microprocessor implements the master side of I2C and SPI networks).

It is important to ensure these pins are driven with the expected waveforms. This is most easily done with a logic analyzer, which I unfortunately do not have (and am not in a position to buy one at the moment). This in mind, it would be convenient to have a device that can let me test each of these circuits in a convenient manner (or at least more convenient than slowing the microprocessor down and filming LEDs update).

Basic Wish

The basic device would physically support up to 4 “sampling” lines, some human input devices (e.g. buttons), and a screen to display data. Using the input devices and screen, the user can set up the device to sample one of the four peripherals:

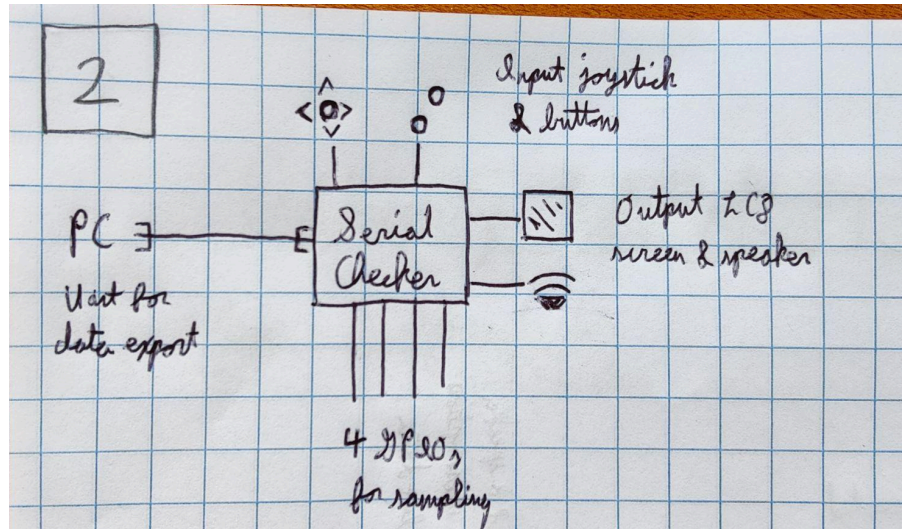
- GPIO pins (2 inputs, 2 outputs)
- UART (2 pins, full duplex)
- I2C (2 pins)
- SPI (4 pins including chip select)

The user can select a sample rate and size, as well as choose between preset options about when to trigger the sampling. Furthermore, the user can select “response” data and choose between preset options on when to send it (these options likely vary between peripheral).

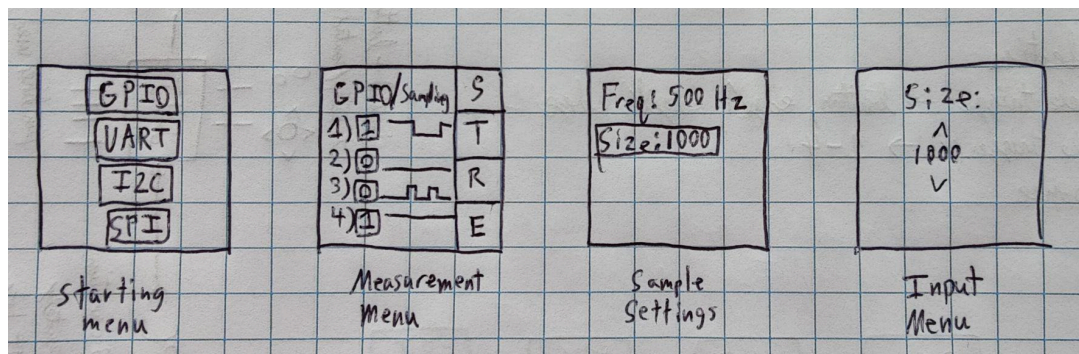
The device should be able to show the sampled data in live time (to a reasonable extent). For more in-depth analysis, the user can have the sampled data exported over the device’s UART/USB.

For the sake of project brevity (and being realistic with the available hardware), many of the details regarding “options” (e.g. trigger types, sample rate minimums, etc) can be either predetermined/hard-coded or based on what the hardware is capable of. The larger concern is making sure there is a decent amount of configurability for the sake of verifying the hardware peripherals work.

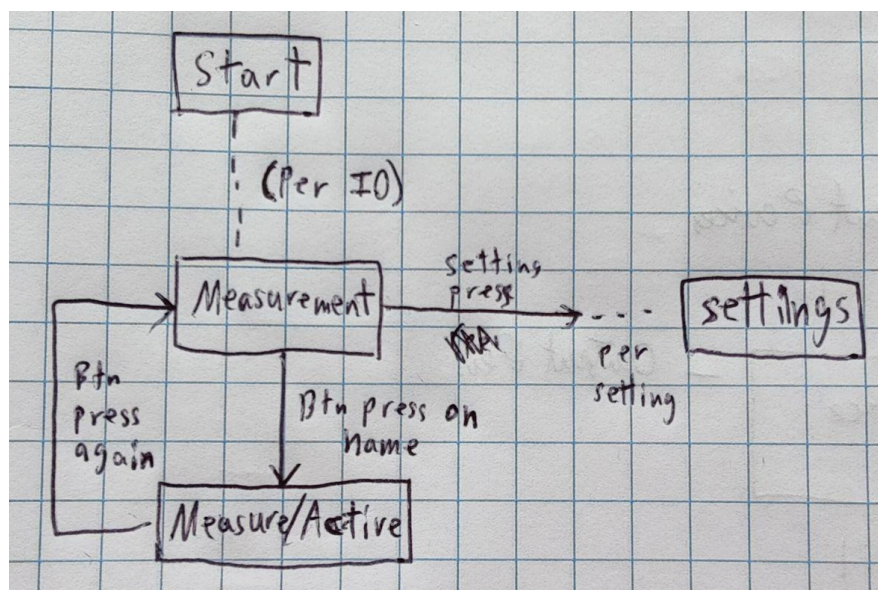
Concept Sketches



- Image 1: Hardware peripherals of the device



- Image 2: Examples of screens on device's LCD



- Image 3: General flow of “windows” on screen

Use Cases

This section captures the breakdown of the user story into different “cases” where the user wants to see a specific behavior.

Selection Use Cases

Use Case #000: Serial Selection

As a user, I want to be able to select which serial I am checking/analyzing.

Use Case #001: Sample Rate

As a user, I want to be able to select a rate to sample data at.

Use Case #002: Sample Size

As a user, I want to be able to select a number of samples to take per analysis.

Use Case #003: Sample Trigger

As a user, I want to be able to select a trigger type that causes data to be sampled.

Use Case #004: Response Trigger

As a user, I want to be able to select a trigger type that causes a response to be sent.

Use Case #005: Serial Response

As a user, I want to be able to select response type/data appropriate to the analyzed serial.

Use Case #006: Export Data

As a user, I want to be able to have the sampled data be exported over USB.

Use Case #007: Predetermined Options

As a user, I want my options per selection to be predetermined by the device (i.e. device has built-in options instead of entered options). An exception is made for any response type/data involving setting raw send data.

Interface Use Cases

Use Case #008: Input Controls

As a user, I want to be able to navigate the device's UI using a 4-way "navigational" joystick, a "confirm" button, and a "cancel" button.

Use Case #009: Visible Cursor

As a user, I want to be able to tell where my "cursor" is on the screen for selection.

Use Case #010: Serial Selected

As a user, while a serial is selected, I want to be able to tell what serial is selected based on the screen.

Use Case #011: GPIO Designation

As a user, while a serial is selected, I want to be able to tell what each pin is representing (e.g. what each hardware GPIO pin is acting as is stated on the screen).

Use Case #012: GPIO Live Value

As a user, while a serial is selected, I want to be able to tell what the live logic level value of each GPIO pin is.

Use Case #013: Analysis State

As a user, while a serial is selected, I want to be able to tell if the device is ready to start analyzing, is waiting for a trigger to occur, or is sampling data.

Use Case #014: Analyzed Data

As a user, while a serial is selected, I want to be able to tell what some of the sampled values were from all GPIO pins (at the same time) after the device finishes sampling.

Revision History

<u>Rev</u>	<u>Date</u>	<u>Description of Changes</u>	<u>Initials</u>
A	05-JUL-2024	Initial draft of user story	J.E.
B	10-JUL-2024	Added initial use cases (based on story)	J.E.