IOT based Garage Door Opener

Group 4
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PCB Implementation

Part 2

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Why PCB implementation is required?

Printed circuit Board commonly abbreviated as PCB is the base of electronics. The PCB provides support as well as electrically connects various Electronic Components in the circuit. After the project is fully working on the breadboard it is important to transfer it to the PCB.

For the prototyping it is always recommended to transfer project to a PCB board. For our project we are using zero Printed circuit board. On this board we will mount all our components which will make our project more presentable and professional.

Introduction to PCB:

- PCB is a acronym of Printed Circuit Board that helps in connecting the electronics components with pads, tracks and lines incorporated on a laminated copper sheet.
- It is considered as an insulating material which can be developed using epoxy on which copper layer is laminated. Before the inception of PCB, professional used laborious method of point to point wiring to connect the electronics components.

Introduction to PCB:

- This method was costly and lead to a most complicated design.In order to get rid of end to end wiring and make the circuit design hassle free, first PCB was developed by Australian Engineer Paul Eisler.
- Mostly, PCBs are composed of composite material, composite epoxy and fiberglass

Types of PCB:

- Single sided PCBs
- Double sided PCBs
- Multilayer PCBs
- High Frequency PCBs
- Aluminium Backed PCBs
- Zero PCBs
- Rigid PCBs
- Flex PCBs
- Rigid-Flex PCBs

Zero PCB Introduction:

Zero PCB is basically a general-purpose printed circuit board (PCB), also known as perfboard or DOT PCB. It is a thin rigid copper sheet with holes pre-drilled at standard intervals across a grid with 2.54mm (0.1-inch) spacing between holes.

Each hole is encircled by a round or square copper pad so that component lead can be inserted into the hole and soldered around the pad without short-circuiting the nearby pads and other leads.

For connecting the lead of component with another lead, solder these together or join these using a suitable conducting wire.

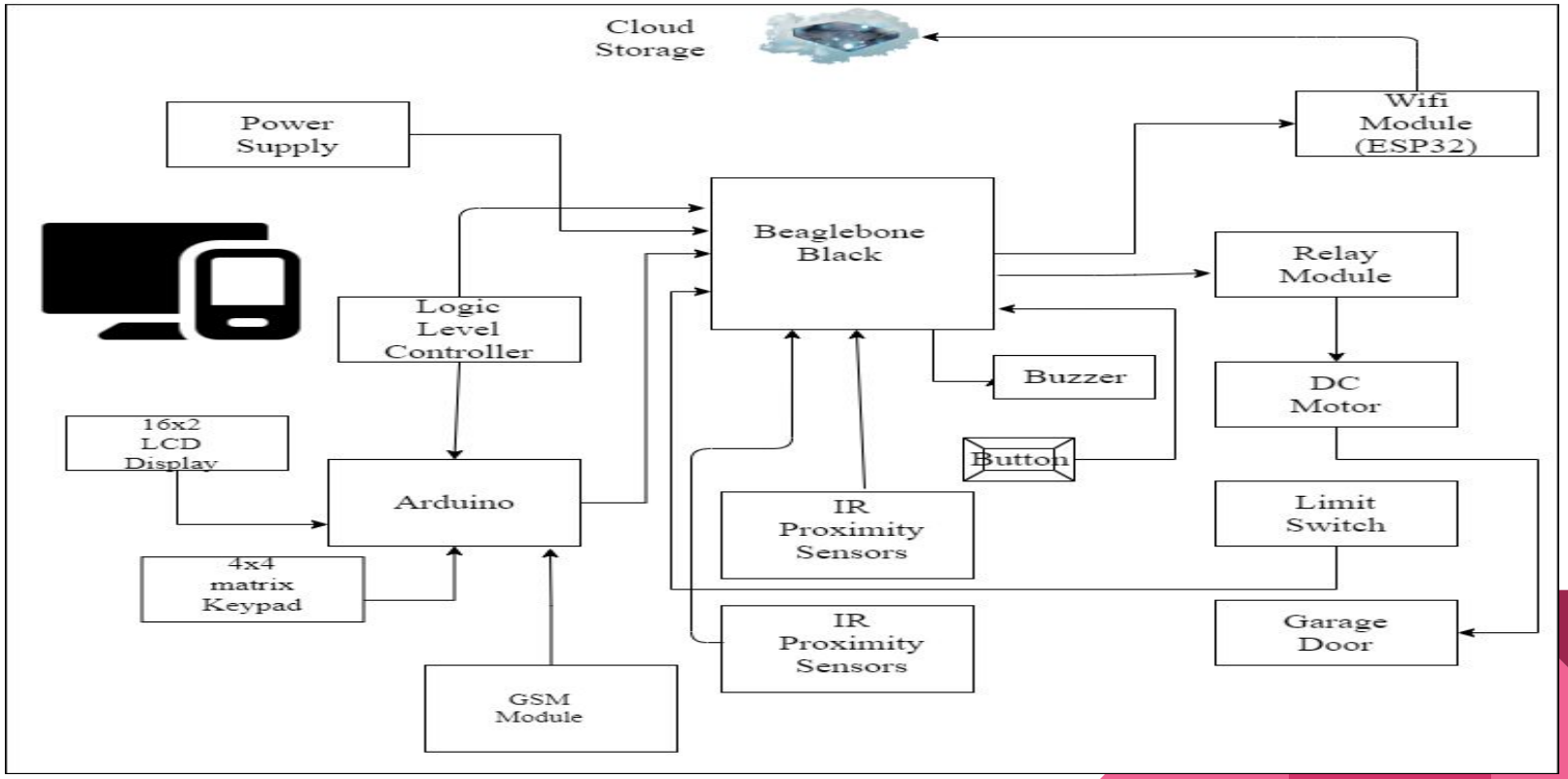
Zero PCB Advantages:

- Low cost.
- Perfect for Prototyping and testing small circuits.
- Perfect for all who are starting with Electronics.
- Short Design Time
- You can change the circuit at any time

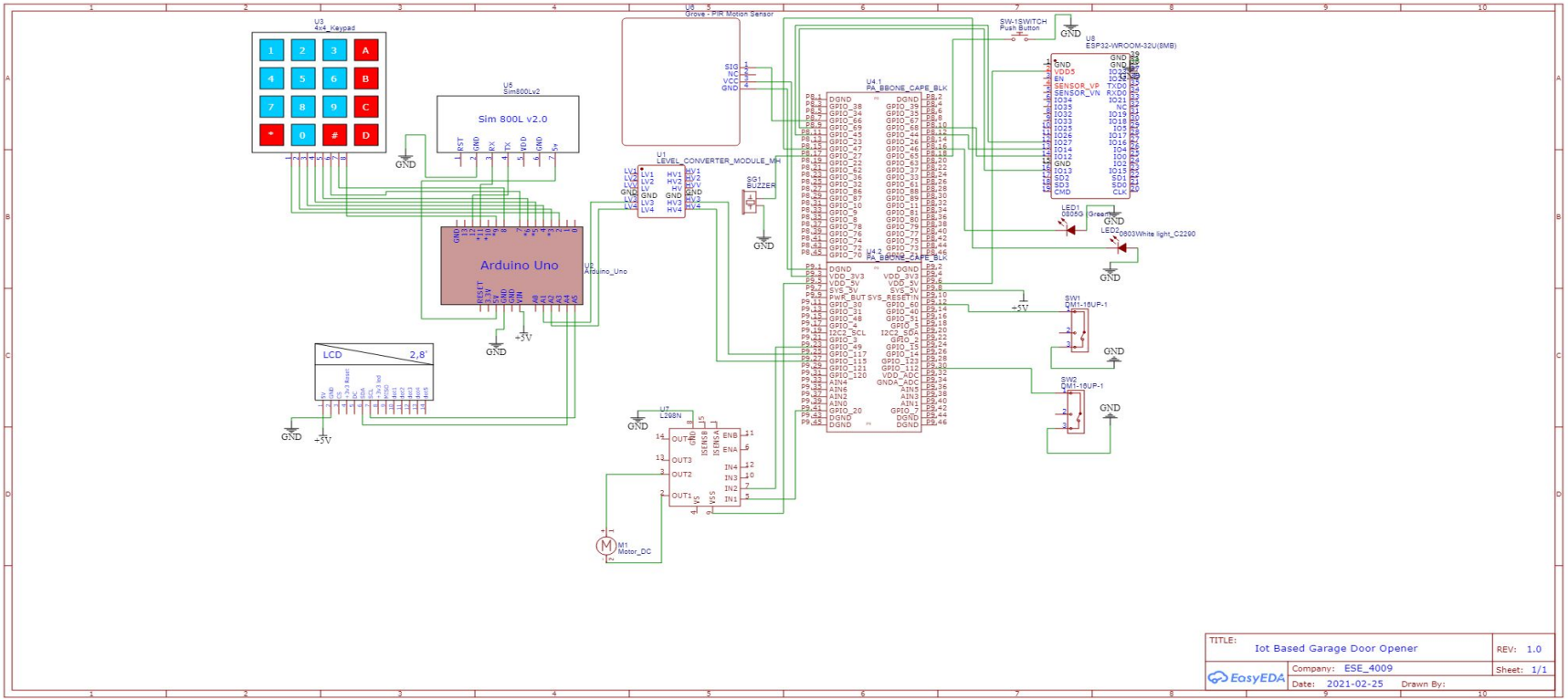
Zero PCB Disadvantages:

- Cannot be used for Mass Production.
- Difficult to Repair or Troubleshoot.
- Soldering skills required.
- Difficult to use for complex circuits.

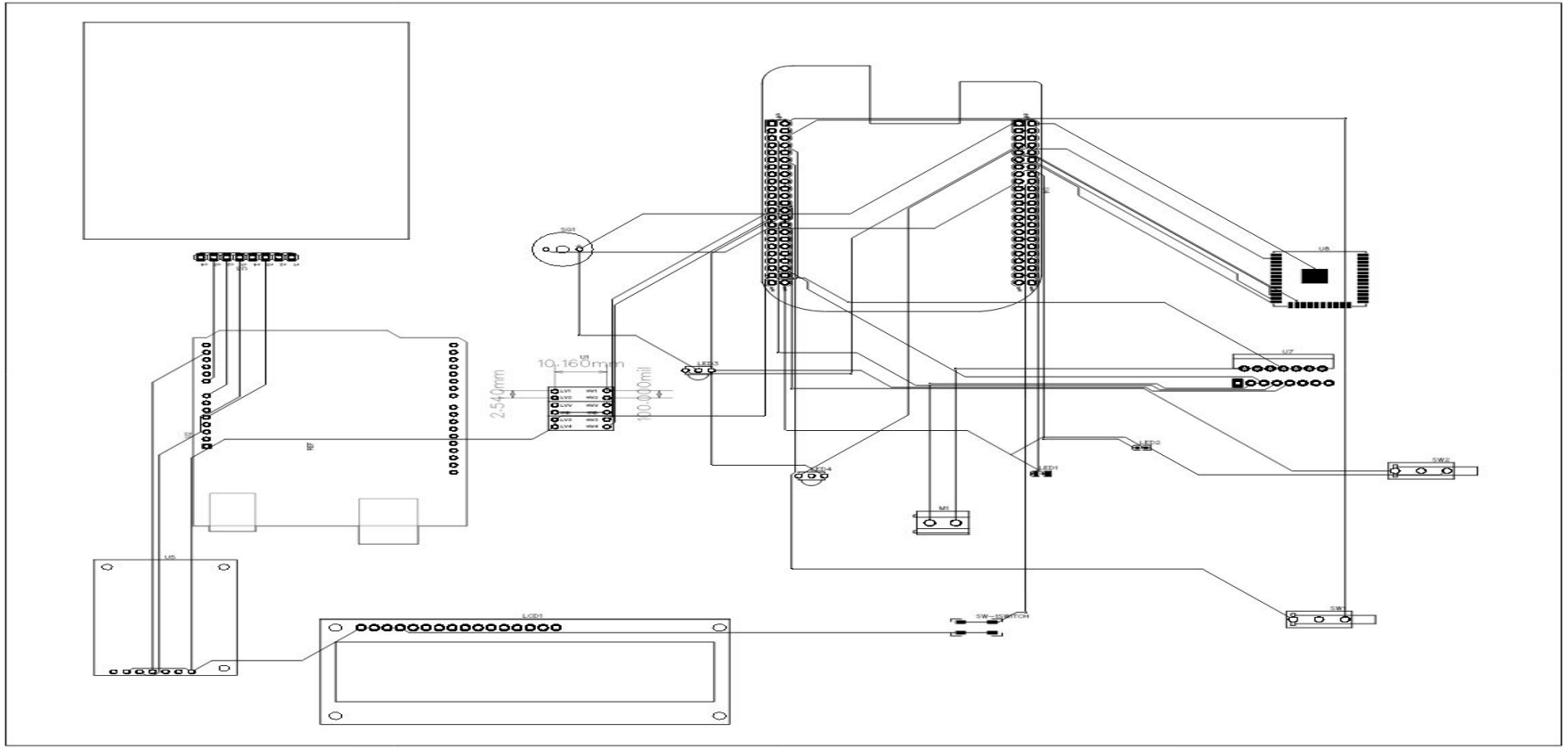
Block Diagram:



Schematic Diagram of Project:

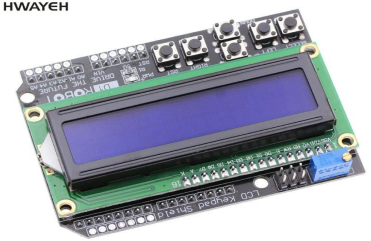


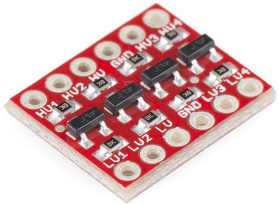
2D design of Project:



Components to Solder:

- Cannot be used for Mass Production.
- Difficult to Repair or Troubleshoot.
- Soldering skills required.
- Difficult to use for complex circuits





Soldering Introduction:

Soldering is the process of a making a sound electrical and mechanical joint between certain metals by joining them with a soft solder. This is a low temperature melting point alloy of lead and tin. The joint is heated to the correct temperature by soldering iron. For most electronic work miniature mains powered soldering irons are used. These consist of a handle onto which is mounted the heating element. On the end of the heating element is what is known as the "bit", so called because it is the bit that heats the joint up. Solder melts at around 190 degrees Centigrade, and the bit reaches a temperature of over 250 degrees Centigrade.

Soldering Tools Required:

- **Soldering Iron:** A soldering iron is a hand tool that plugs into a standard 120v AC outlet and heats up in order to melt solder around electrical connections. This is one of the most important tools used in soldering and it can come in a few variations such as pen or gun form.

Soldering Tools Required:

- **Soldering Station:** A soldering station is a more advanced version of the basic standalone soldering pen.
  If you are going to be doing a lot of soldering, these are great to have as they offer more flexibility and control. The main benefit of a soldering station is the ability to precisely adjust the temperature of the soldering iron which is great for a range of projects.

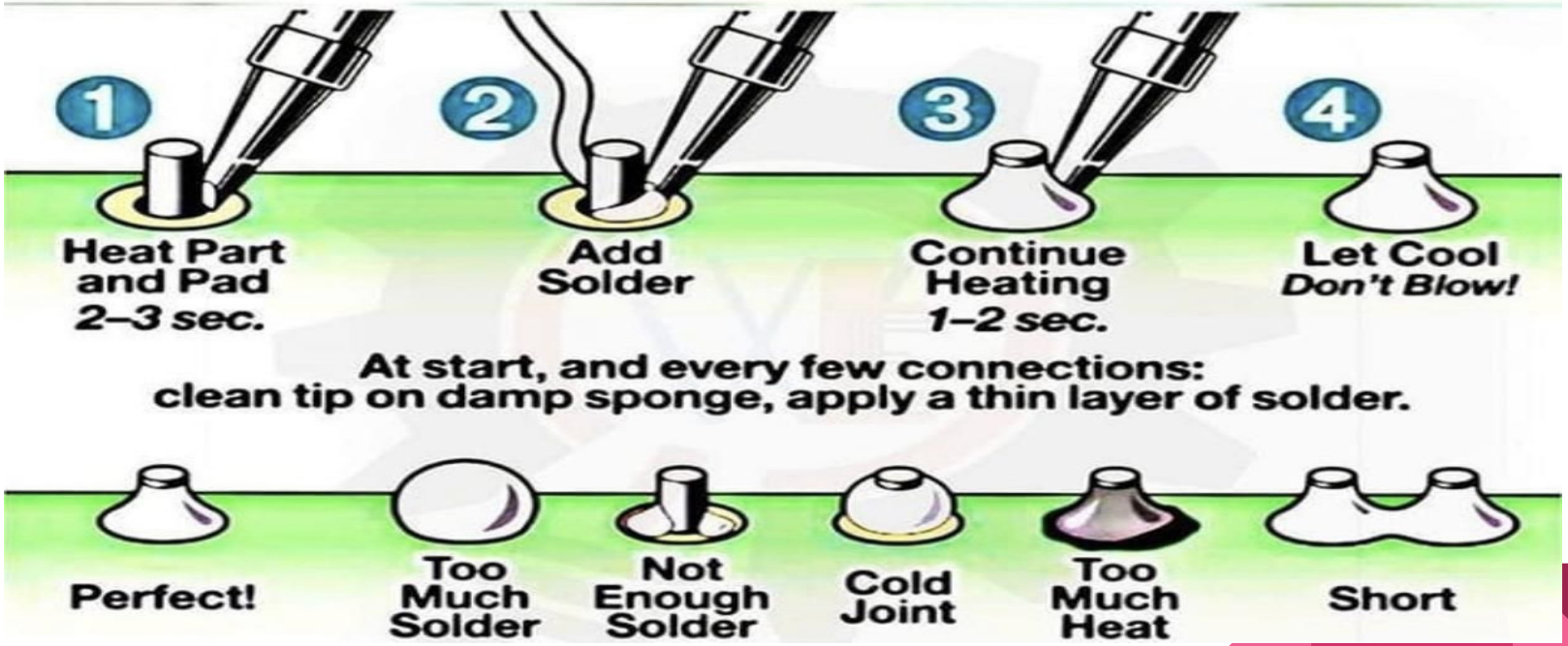
Soldering Tools Required:

- **<u>Soldering Iron tips:</u>**
  Conical Tip – Used in precision electronics soldering because of the fine tip. Because of its pointed end, it's able to deliver heat to smaller areas without affecting its surroundings.
  Chisel Tip – This tip is well-suited to soldering wires or other larger components because of its broad flat tip.

Soldering Tools Required:

- **Solder:**Solder is a metal alloy material that is melted to create a permanent bond between electrical parts. It comes in both lead and lead-free variations with diameters of .032" and .062" being the most common.

Soldering - How to Solder:



Connection- BBB with Arduino Uno:

Beaglebone Black connected to Arduino Uno through logic level controller.

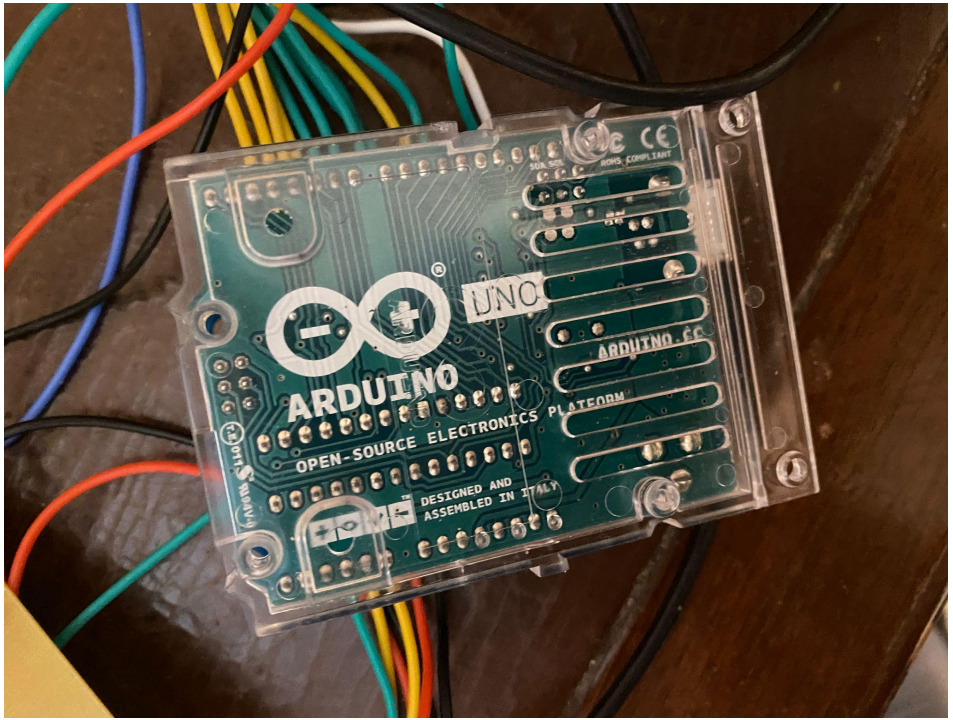
P9 25 BBB - LV1 - HV1 - A0 Arduino

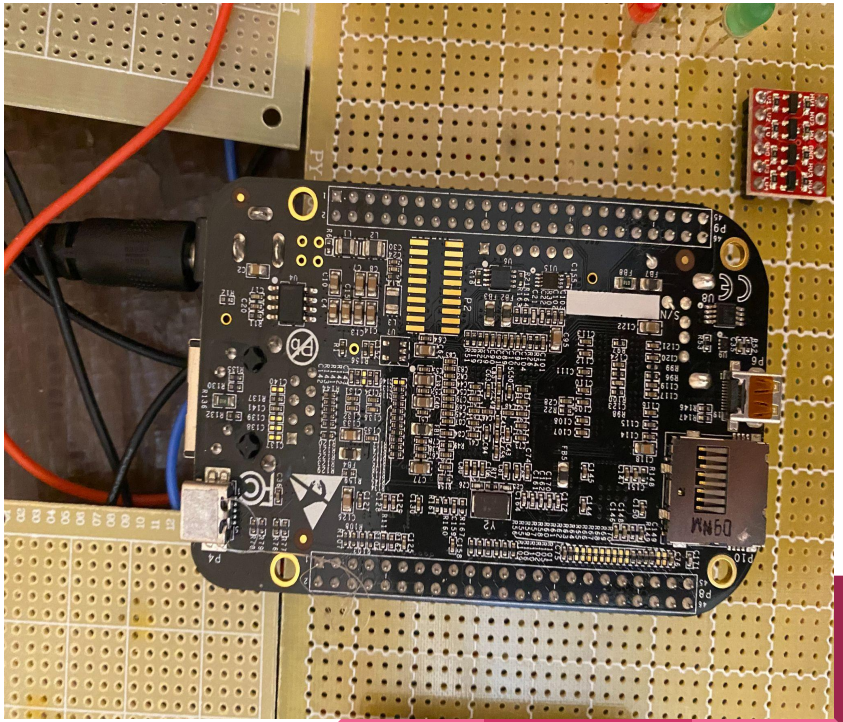
P9 27 BBB - LV2 - HV2 - A1 Arduino

Arduino GND to BBB GND

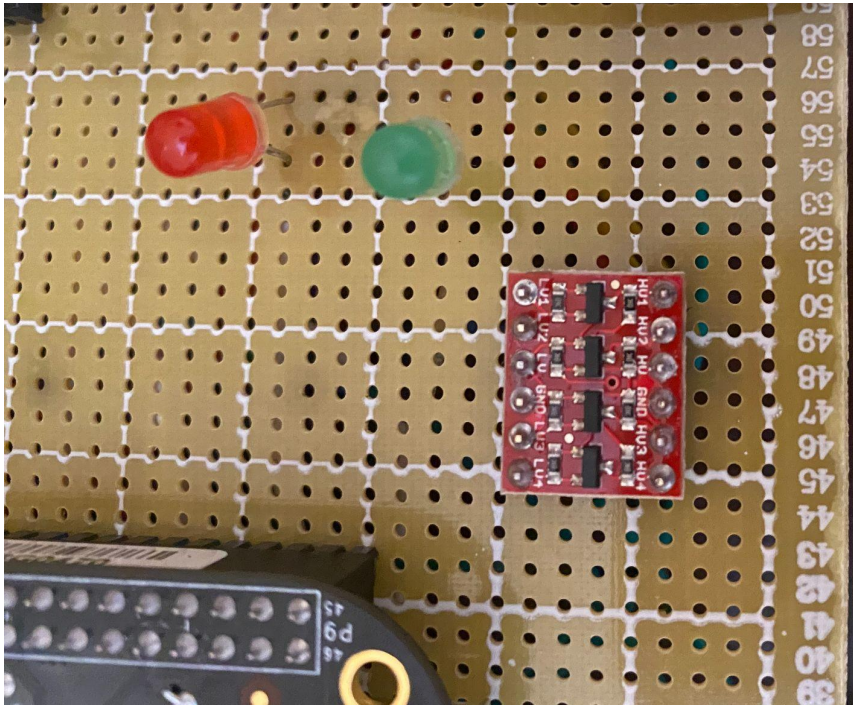
3.3V BBB - LV - HV - 5V Arduino

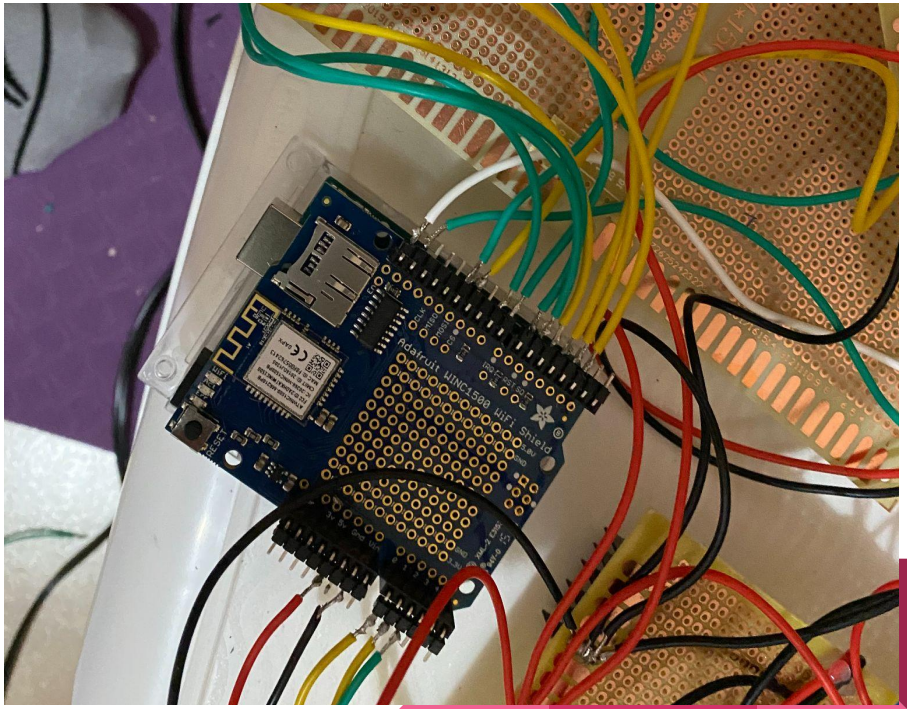
Connection- BBB with Arduino Uno:





Connection- BBB with Arduino Uno:





Connection- Arduino Uno - LCD:

Arduino Uno and LCD connection

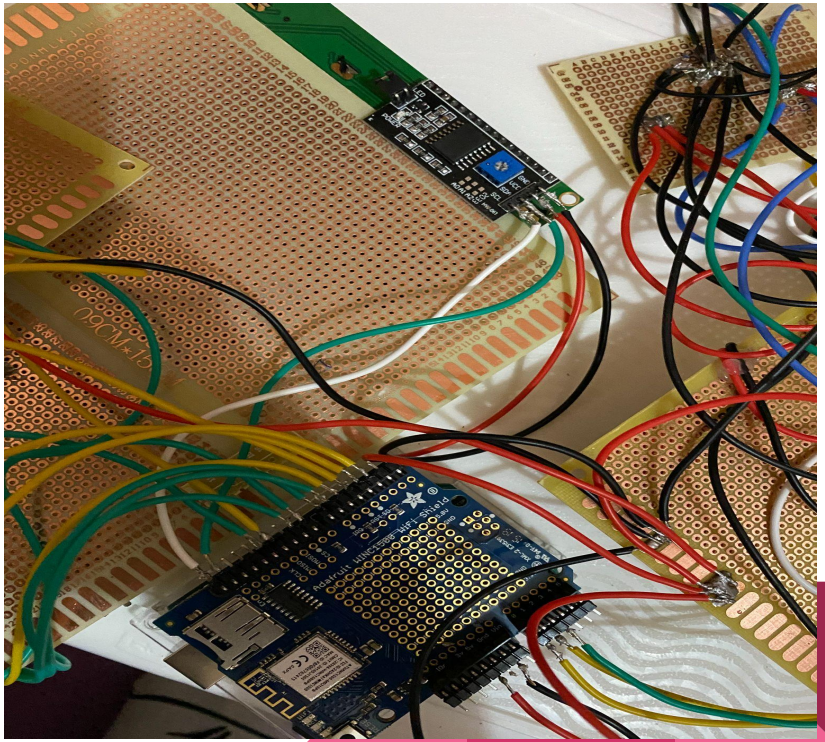
5V Arduino - Vcc LCD

GND Arduino - GND Arduino

SCL pin - SCL LCD

SDA pin - SDA LCD

Connection- Arduino Uno - LCD:



Connection- Arduino Uno - Keypad:

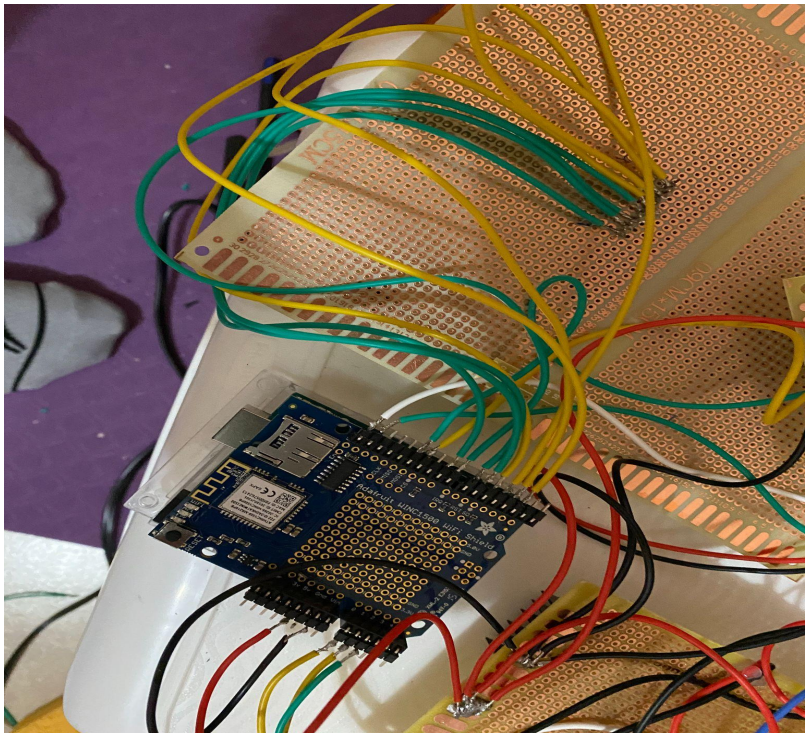
Arduino Uno and Keypad connection

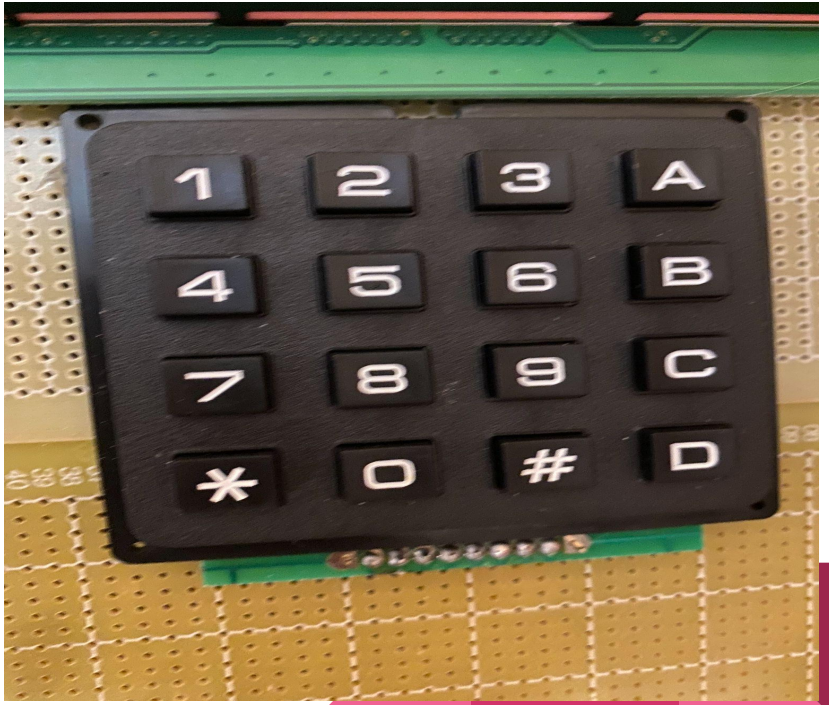
Keypad pin - Arduino Pin number

R1,R2,R3,R4 - D9,D8,D7,D6

C1,C2,C3,C4 - D5,D4,D3,D2

Connection- Arduino Uno - Keypad:





Connection- Arduino Uno - GSM Module:

Arduino Uno and GSM module connection

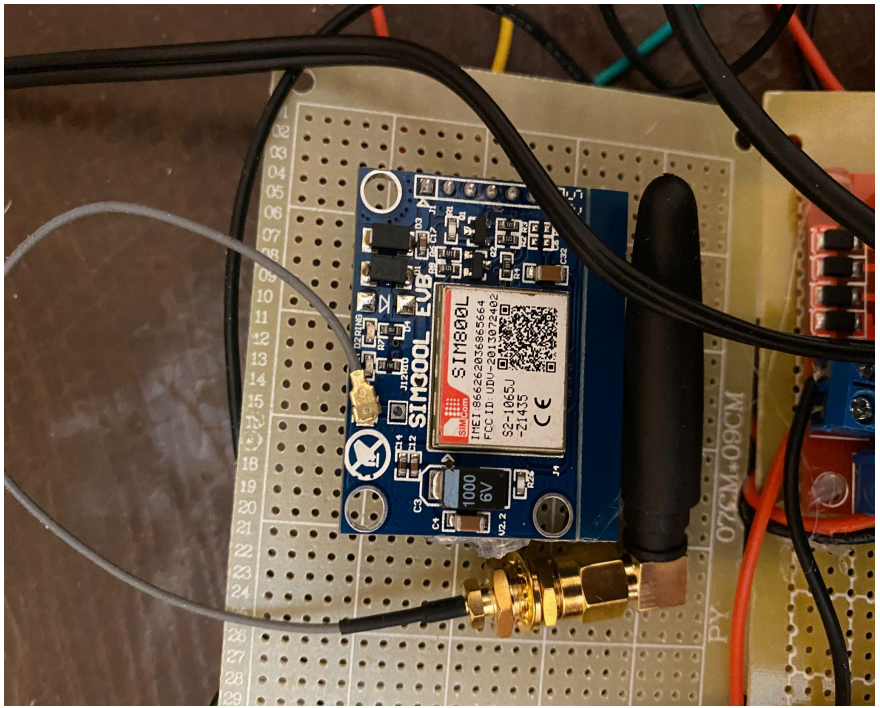
Pin Vcc GSM module - 5V Arduino

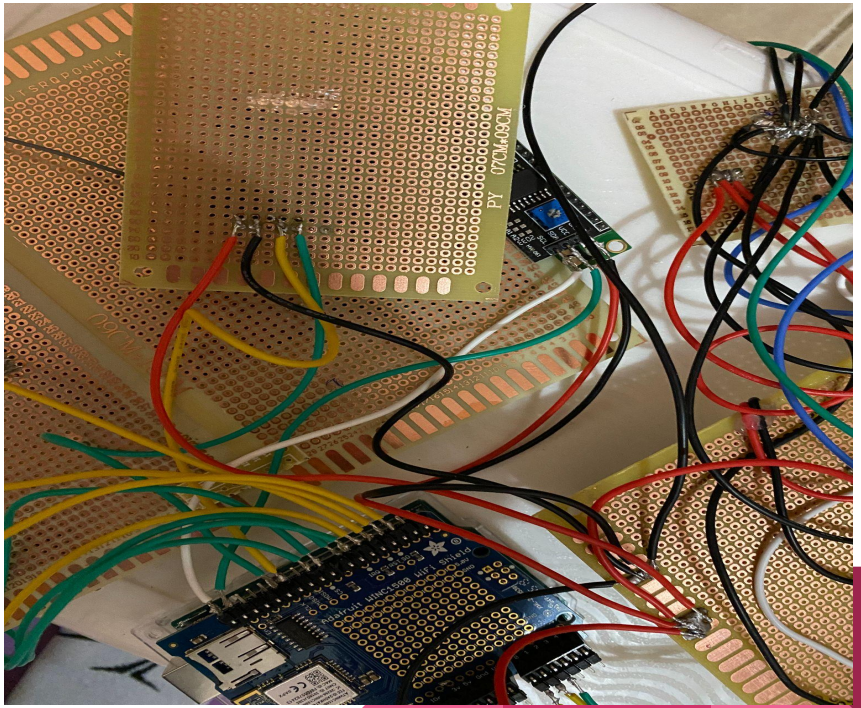
GND - GND

Transmitter pin - D11 pin Arduino

Receiver pin - D12 pin Arduino

Connection- Arduino Uno - GSM Module:





Continuity Testing:

In electronics, a continuity test is the checking of an electric circuit to see if current flows (that it is in fact a complete circuit).

A continuity test is performed by placing a small voltage across the chosen path.

If electron flow is inhibited by broken conductors, damaged components, or excessive resistance, the circuit is "open".

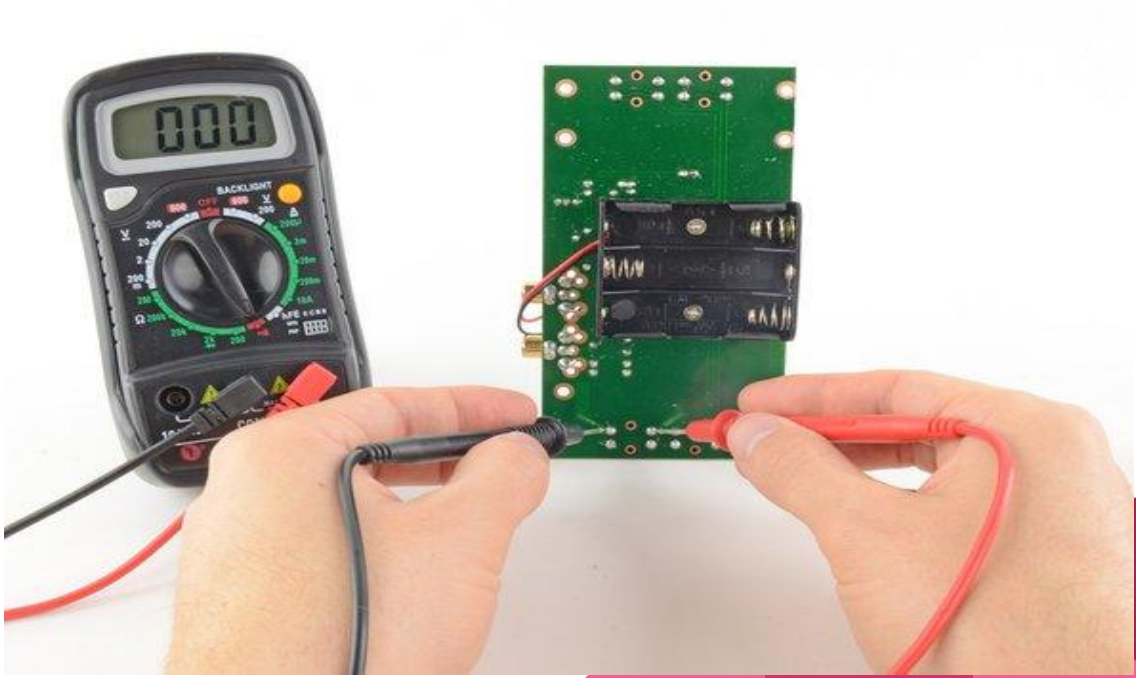
Devices that can be used to perform continuity tests include multimeters which measure current and specialized continuity testers which are cheaper, more basic devices, generally with a simple light bulb that lights up when current flows.

Continuity Testing:

Steps

1. Plug the black probe into the COM port on your multimeter. Plug the red probe into the VΩmA port.
2. Switch on your multimeter, and set the dial to continuity mode (indicated by an icon that looks like a sound wave).
3. The multimeter tests continuity by sending a little current through one probe, and checking whether the other probe receives it. If the probes are connected—either by a continuous circuit, or by touching each other directly—the test current flows through. The screen displays a value of zero (or near zero), and the multimeter beeps. Continuity! If the test current isn't detected, it means there's no continuity. The screen will display 1 or OL (open loop).

Continuity Testing:



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