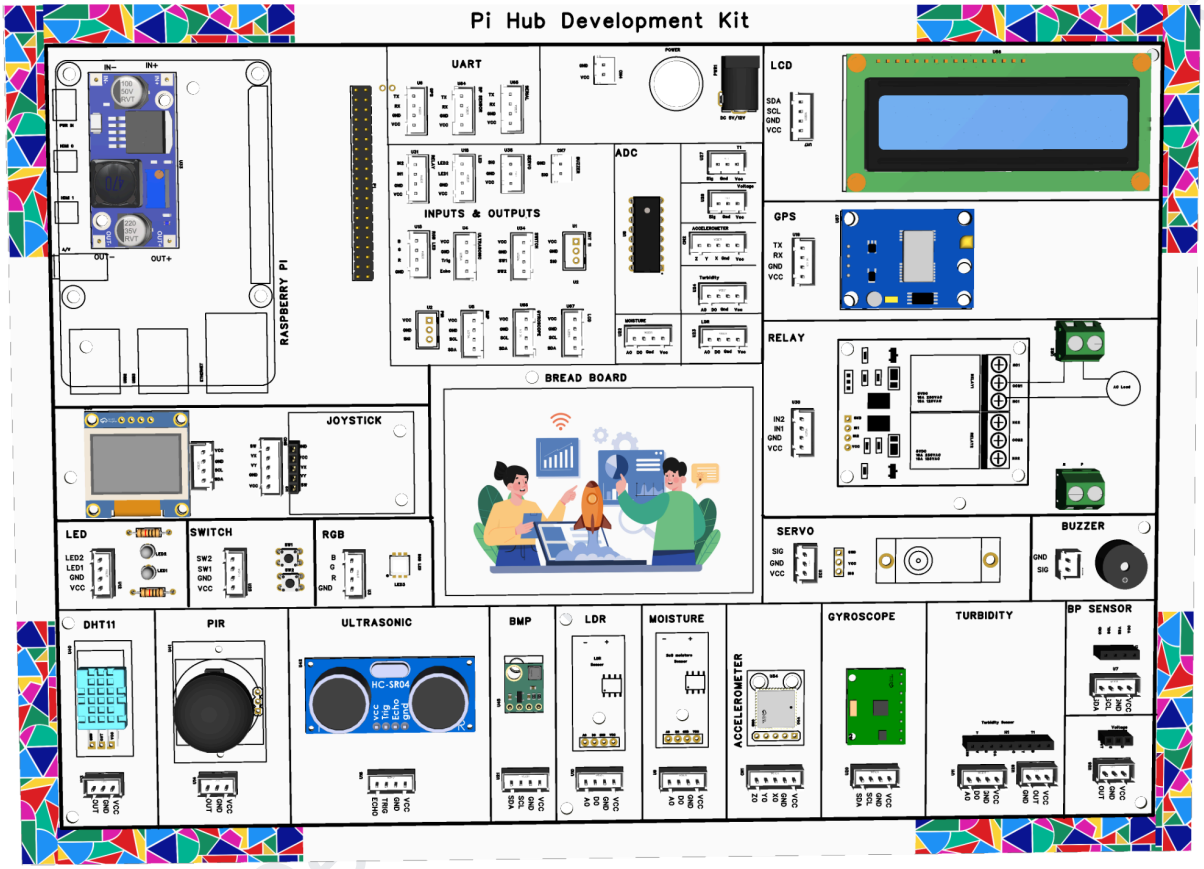
Pi Hub Development Kit



Datasheet

Key Features

- Seamless Raspberry Pi interface with **JST connectors**
- Over **20 pre-integrated sensors and modules**
- Dedicated **UART, ADC, and I/O interface sections**
- Plug-and-play design with minimal wiring
- Supports **Python programming** with ready-to-use libraries
- Integrated **Breadboard** for custom prototyping

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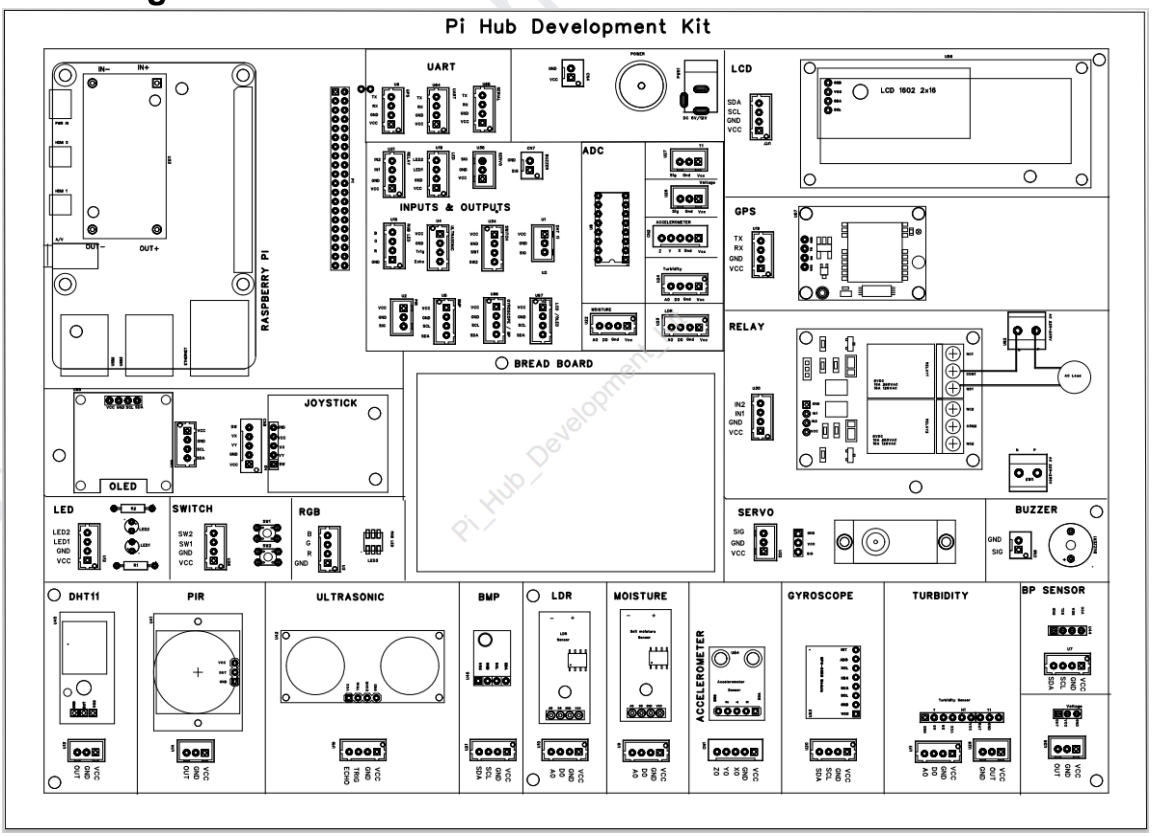
1. Overview

The **Pi Hub Development Kit** is an integrated development board designed for interfacing multiple sensors and I/O modules with the Raspberry Pi through JST connectors. It simplifies rapid prototyping for IoT, robotics, and smart systems.

2. Specifications

Parameter	Specification
Input Voltage	(5V DC Raspberry Pi and 12V DC External Adapter)
Communication Interface	UART, I2C, ADC, GPIO
Number of Sensors	20+ Modules
Connector Type	JST Connectors
Programming Language	Python
Compatible Boards	Raspberry Pi 3, 4, and Zero

3. Pin Configurations



3.1 Input Digital mode Sensors

S.no	Sensor	Description	Pinout Description	From JST Connector No.	To JST Connector No	Sensor pin connected to Raspberry Pi GPIO
1.	DHT11	Measures temperature and humidity.	VCC, GND, Data	U13	U1	Data pin to GPIO 4
2.	PIR	Detects motion by sensing changes in infrared radiation.	VCC, GND, Out	U14	U2	Out pin to GPIO17
3.	Ultrasonic	Measures distance using ultrasonic sound waves.	VCC, GND, Trig, Echo	U16	U4	Trig pin to GPIO5, Echo pin to GPIO 6
4.	BMP	Measures barometric pressure and temperature.	VCC, GND, SCL, SDA	U21	U5	SCL pin to GPIO3,SDA pin to GPIO2
5.	Gyroscope	Measures angular velocity or rotational rate.	VCC, GND, SCL, SDA	CN1	U66	SCL pin to GPIO3,SDA pin to GPIO2
6.	BP Sensor	Measures blood pressure.	VCC, SDA, SCL, GND	U44	U66	SCL pin to GPIO3,SDA pin to GPIO2
7.	Switch	Detects a closed or open circuit, indicating an on/off state.	VCC, GND, SW1, SW2	U25	U34	SW1 to GPIO22,SW2 to GPIO27

3.2 Input Analog mode Sensors using mcp3008

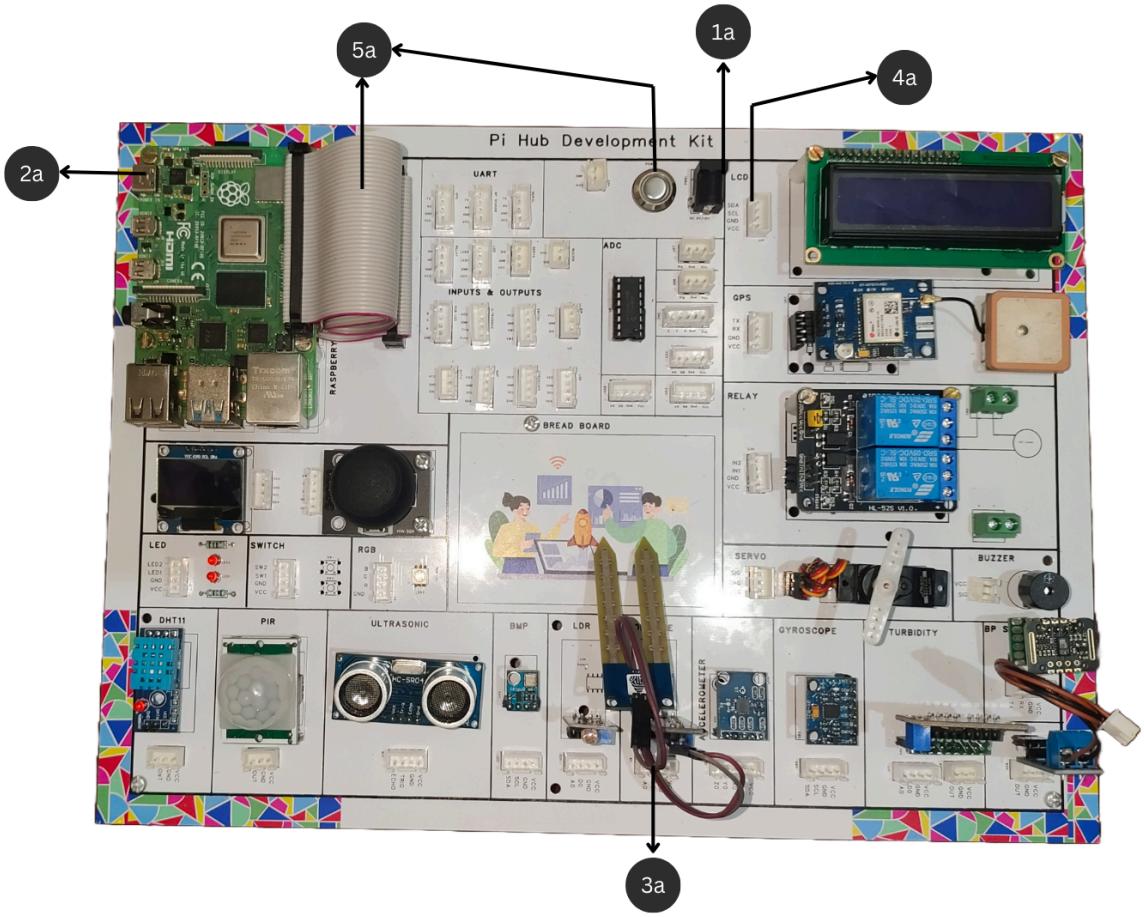
S.no	Sensor	Description	Pinout Description	From JST Connector No.	To JST Connector No	Sensor pin connected to Raspberry Pi GPIO
8.	LDR	Measures light intensity.	VCC, GND, D0,A0	U10	U23	A0 pin to mcp3008 CH1
9.	Moisture	Measures the moisture content in soil or other materials.	VCC, GND, D0,A0	U9	U22	A0 pin to mcp3008 CH0
10.	Turbidity	Measures the cloudiness or haziness of a fluid caused by suspended solids.	VCC, GND, AO, DO	U11	U24	A0 pin to mcp3008 CH2
11.	Voltage Detection	Measures DC Voltage.	VCC, GND, OUT	U28	U26	Out pin to mcp3008 CH6
12.	Accelerometer	Measures acceleration and detects changes in motion or orientation.	VCC,GND,X0,Y0,Z0	U20	CN2	X0,Y0,Z0 pin to mcp3008 CH3,CH4,CH5 respectively
13	Joystick	Provides multi-directional input for controlling movement or position.	VCC,GND, VX, VY, SW	CN8	CN2	VX,VY,SW pin to mcp3008 CH3,CH4,CH5 respectively

3.3 Output Devices

S.no	Output device	Description	Pinout Description	From JST Connector No.	To JST Connector No	Output Signal pin connected to Raspberry Pi GPIO
14.	LED	Light emitting diode. Note: LED1 in common cathode mode, LED2 in common anode mode.	VCC, GND, LED1,LED2	U12	U18	LED1,LED2 pin to GPIO18,GPIO16 respectively
15.	RGB LED	SMD5050 RGB LED common cathode mode	R,G,B,GND	U3	U15	B ,G,R pin to GPIO26,GPIO19 ,GPIO13 respectively
16.	Servo Motor	Motor Rotates to a specific position.	VCC,GND,SIG	U32	U35	SIG pin to GPIO12
17.	BUZZER	Produces a sound typically a beep or tone	VCC,SIG	CN6	CN7	SIG pin to GPIO25
18.	OLED	Organic light-emitting diodes	VCC,GND,SCL,SDA	U69	U67	SCL pin to GPIO3,SDA pin to GPIO2
19.	Relay	2 channel 5v relay module, Electrically controlled switch	VCC,GND,IN1,IN2	U30	U31	IN2,IN1 pins connected to

		used to turn high-power circuits on or off				GPIO24,GPIO23 respectively
20	GPS	Provides location and time information via satellite signals	VCC,GND,RX,TX	U19	U6	RX pin to UART_TX, TX pin to UART_RX
21	16x2 LCD	I2C 16x2 LCD ”Displays text and characters in a 16-character by 2-line format”	VCC,GND,SCL,SDA	U17	U67	SCL pin to GPIO3,SDA pin to GPIO2

3.4 Full instructions for setup your Pi Hub Development Board



1a. Powering the Board

- Ensure the power switch is in the OFF position (not pressed in).
- Connect the 12V 5A DC power adapter to the power jack on the board.
- Plug the power adapter into a standard wall outlet.

2a. Powering the Raspberry Pi

- Connect the 5V 3A power adapter to your Raspberry Pi's power input USB-C.
- Plug the power adapter into a standard wall outlet.

3a. Understanding the Wiring Table

We'll use the soil moisture sensor as an example to demonstrate the connection process.

From the connection table:

Sensor	Description	Pinout Description	From JST Connector No.	To JST Connector No	Sensor pin connected to Raspberry Pi GPIO
Moisture	Measures the moisture content in soil or other materials.	VCC, GND, D0,A0	U9	U22	A0 pin to mcp3008 CH0
16x2 LCD	I2C 16x2 LCD ”Displays text and characters in a 16-character by 2-line format”	VCC,GND,SCL,SDA	U17	U67	SCL pin to GPIO3,SDA pin to GPIO2

This means:

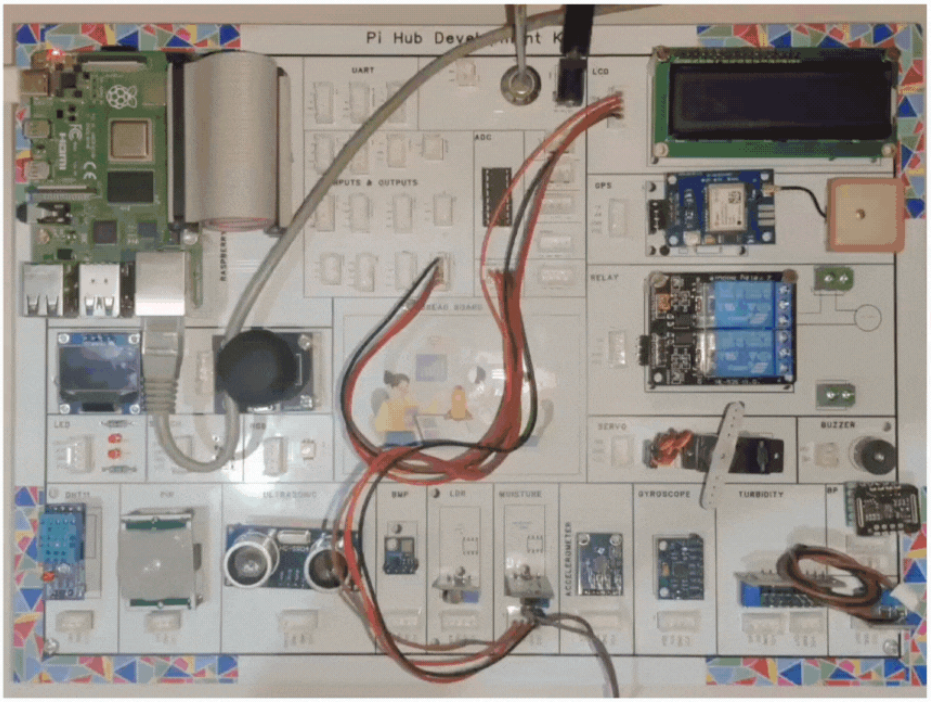
- The soil moisture sensor should be connected to JST connector U9 to JST connector U22 on the board
- The A0 pin from the sensor is connected to channel 0 of the MCP3008
- The 16x2 LCD display should be connected to JST connector U17 to JST connector U67 on the board

4a. Making the Connection

- Ensure the board is powered OFF before connecting or disconnecting any sensors.
- Locate the soil moisture sensor and its connector cable.
- Find the JST connector labeled U9,U22, U17, U67 on your sensor board.
- Align the moisture sensor as shown in the overview image then use a 4 pin female JST connector from U9 to U22, ensuring the orientation is correct.
- Align the I2C 16x2 LCD as shown in the overview image then use a 4 pin female JST connector from U17 to U67, ensuring the orientation is correct.
- Gently but firmly push the connector into the socket until it clicks into place.
- Double-check that the connection is secure.

5a. Connecting the Board to Raspberry Pi

- Ensure both the Raspberry Pi and the board are powered OFF.
- Carefully align the GPIO connector on the board with the GPIO pins on your Raspberry Pi.
- Gently press the connector onto the GPIO pins, ensuring all pins are properly aligned.
- Double-check the connection to make sure it's secure and properly aligned as shown in the below figure.
- Power ON the board by pressing the power button.



6a. Installing Required Software

- Before using the board, you'll need to install the necessary software on your Raspberry Pi:
- Boot up your Raspberry Pi and open a terminal window.
- Update your system:

```
sudo apt-get update

sudo apt-get upgrade
```

- Clone this repository:

```
git clone https://github.com/yoga495/Pi_Hub_Development_Kit.git
```

- For more details follow the readme instructions

7a. Running the Test Code

- Open a terminal on your Raspberry Pi and navigate to the scripts directory:

```
cd Analog_Mode_Devices

chmod +x *.py
```

- Run the moisture sensor test script:

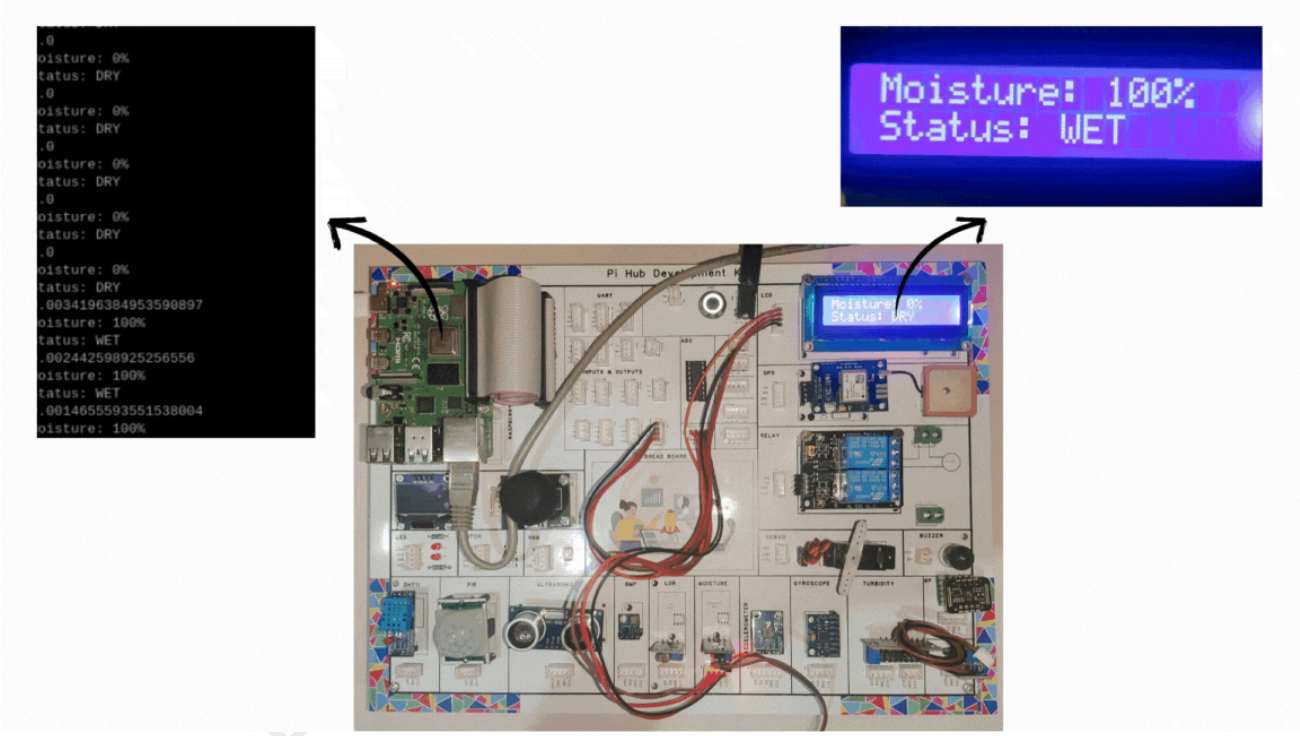
```
python3 moisture-sensor-test.py
```

- Run the moisture sensor test script to display on lcd:

```
python3 moisture-sensor-test.py
```

8a. Interpreting the Results

The moisture sensor test will:



- Display moisture levels on the LCD screen
- Show a percentage value (0% = completely dry, 100% = fully saturated)
- Display a status message (DRY, MOIST, or WET)

Try the following to test your sensor:

- Leave the sensor in air (should read very low moisture)
- Place it in slightly damp soil (should show moderate moisture)
- Place it in a cup of water (should read high moisture)

The process for connecting other sensors is similar to the moisture sensor example. Refer to the above connection table for the specific JST connectors to use.

4. Power Distribution

The board integrates an onboard **Buck Converter** that regulates input voltage 12v to 5V DC, ensuring stable operation for all connected modules.

- Input Voltage 1: **12V 5A DC (External Power Adaptor for Pi Hub Development)**
- Input Voltage 2: **5V 3A DC (External Power Adaptor for Raspberry pi)**
- Regulated Output: **5V DC**
- Maximum Current: **5A**

5. Communication Interfaces

- UART: GPS, Serial Sensors, GPS
- I2C: BMP, Gyroscope, LCD,BP Sensor,OLED,
- ADC: Moisture, LDR,Turbidity, Voltage, Accelerometer, Joystick.
- GPIO: Relay, Switches, Buzzer,LED, DHT11, PIR, Ultrasonic, RGB LED,

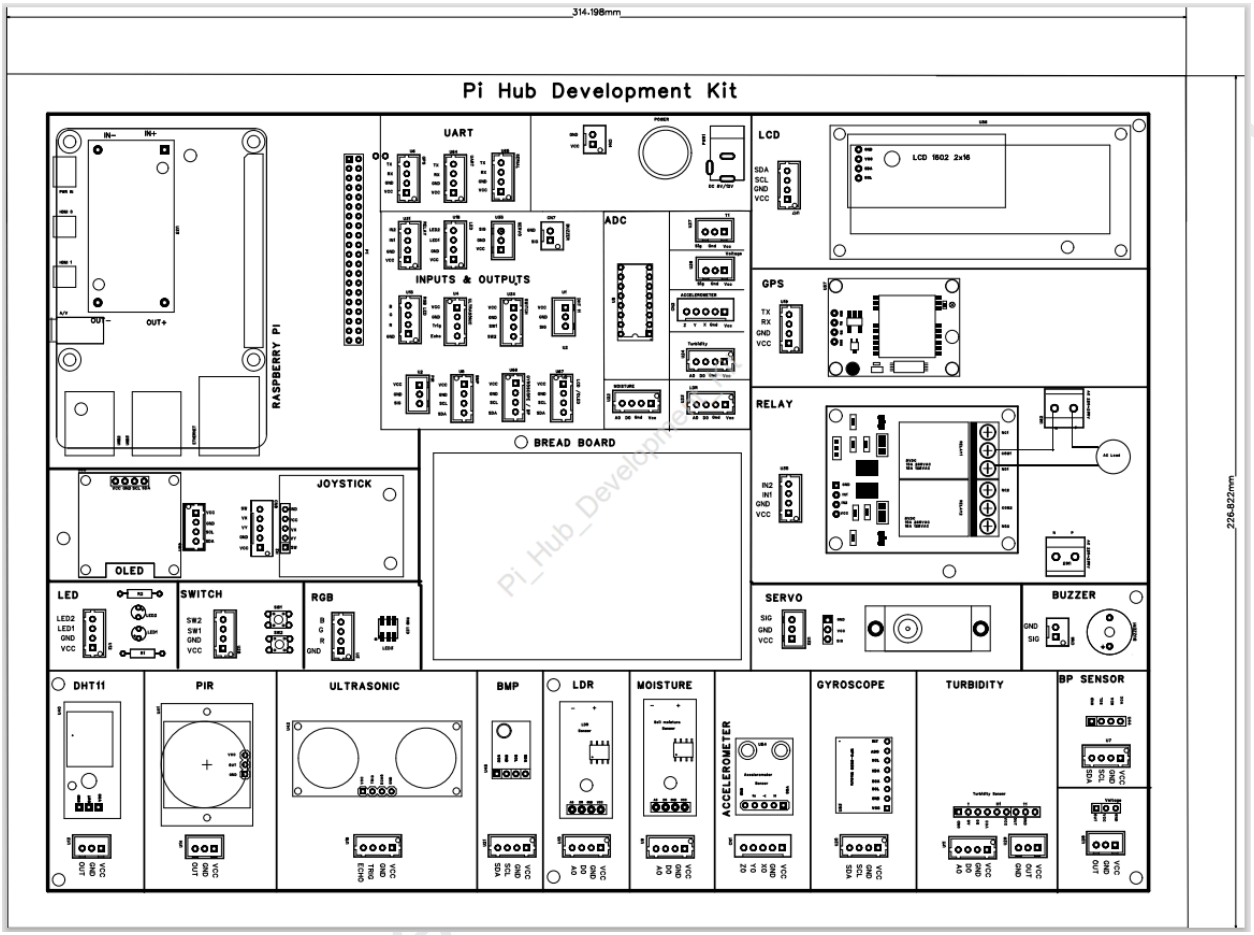
6. LED Indicators

- Power LED 1: Board Switch ON
- Power LED 2: Regulated Output
- Relay LED: Relay Activation
- Sensor LED: Sensor Activation

7. Environmental Ratings

Parameter	Specification
Operating Voltage	5V DC
Operating Temperature	-10°C to 50°C
Storage Temperature	-20°C to 70°C
Humidity	10% to 90% RH

8. Dimensions



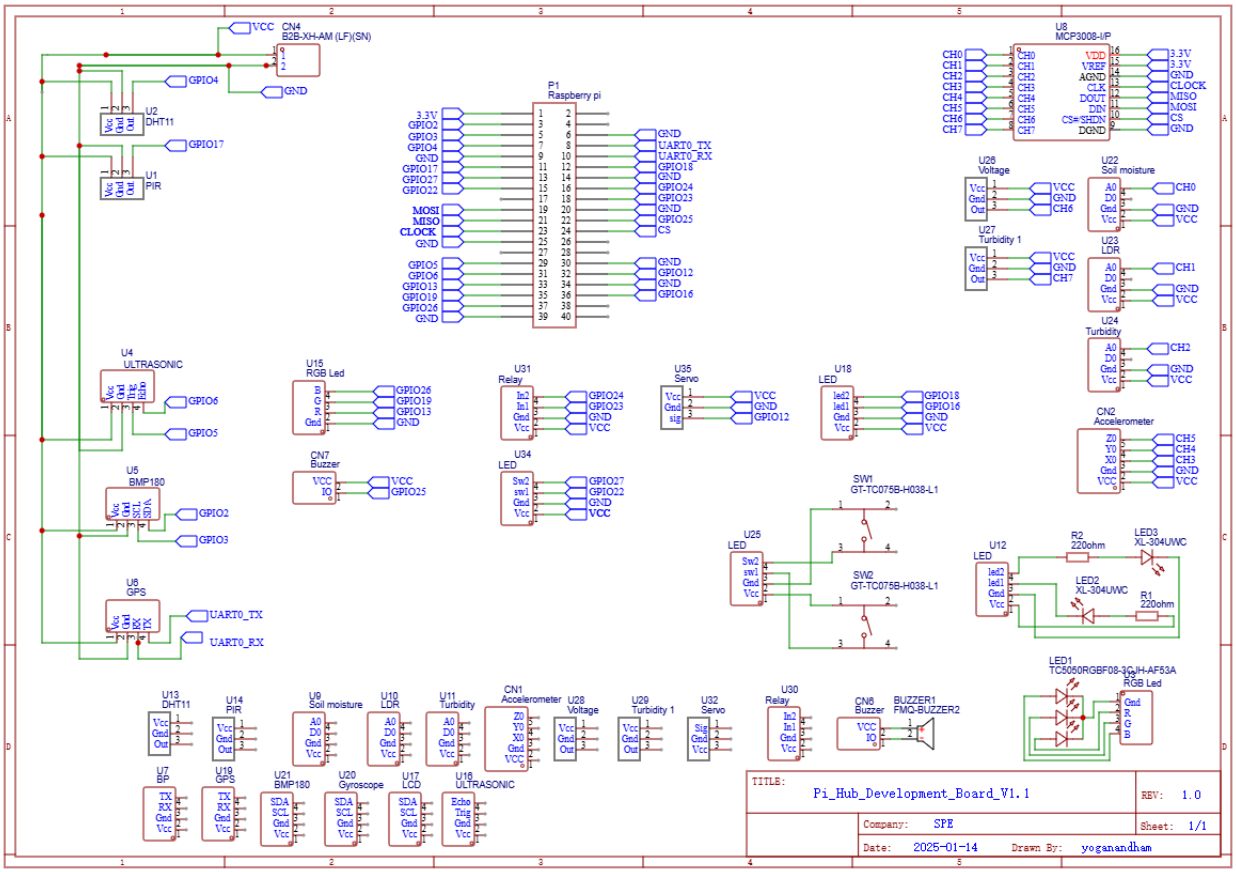
Top view

- Board Size: **~ 315mm x 227mm**
- Mounting Holes: **4 x M3 Holes**

9. Applications

- IoT Prototyping
- Robotics Projects
- Environmental Monitoring
- Smart Home Automation
- Educational Projects

10. Pi Hub Dev Kit Schematic



For more details, refer to the User Manual and source codes on the **GitHub repository**.