

Calculator using Wiring Pi and LCD

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1 OBJECTIVE

To make a simple calculator using Raspberry Pi where input is given through keyboard and display the whole operation on a 16x2 LCD display.

2 COMPONENTS REQUIRED

- 1) Resistor-220Ohm
- 2) Raspberry Pi
- 3) 16x2 LCD display
- 4) Jumper wires

3 INTRODUCTION

3.1 Raspberry Pi

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard, mouse, power supply and a micro SD card with installed Linux Distribution. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

3.2 16x2 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.

4 HARDWARE SETUP

4.1 LCD to Raspberry Pi connections

- 1) Connect the 5V pin i.e., pin 2 of the Raspberry Pi to an extreme pin of the Breadboard. Let this pin be Vcc.

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GPIO#	NAME				NAME	GPIO#
1	3.3 VDC Power				5	5.0 VDC Power
2	GPIO 4 (BCM2835)				6	Ground
3	GPIO 0 (BCM2835)				7	GPIO 15 (TXD UART)
4	GPIO 2 (BCM2835)				8	GPIO 16 (RXD UART)
5	Ground				9	GPIO 1 (PCM_CLKPWR)
6	GPIO 3 (BCM2835)				10	Ground
7	3.3 VDC Power				11	GPIO 5
8	GPIO 12 (MOSI SPI)				12	Ground
9	GPIO 13 (MISO SPI)				13	GPIO 6
10	GPIO 14 (SCLK SPI)				14	GPIO 10 (CE0 SPI)
11	Ground				15	GPIO 11 (CE1 SPI)
12	SDA0 (I2C ID EEPROM)				16	GPIO 18 (I2C ID EEPROM)
13	GPIO 21 (GPIO)				17	Ground
14	GPIO 22 (GPIO)				18	GPIO 26 (PWM0)
15	GPIO 23 (PWM1)				19	Ground
16	GPIO 24 (PCM_FSPWRM1)				20	GPIO 27
17	GPIO 25 (PCM_DIN)				21	GPIO 28 (PCM_DIN)
18	Ground				22	GPIO 29 (PCM_DOUT)

Fig. 1: RPi 3B pin diagram

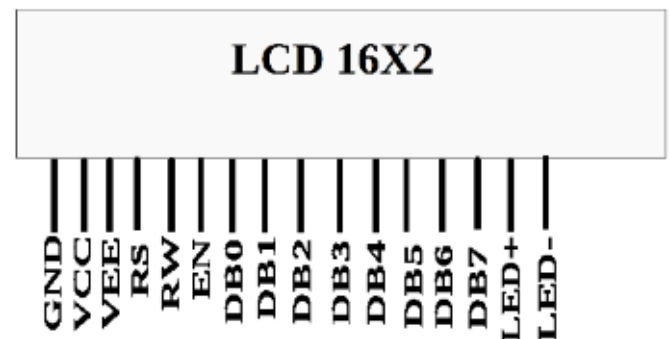


Fig. 2: LCD pin out

- 2) Connect the GND pin i.e., pin 6 of the Pi to the opposite extreme pin of the Breadboard.
- 3) Plug the LCD in Figure 1 to the bread-board.
- 4) Connect the 220Ω resistance from Vcc to pin 15 (Led+) of the LCD.
- 5) Connect the raspberry pi pins to the LCD display as shown in the table below.

LCD pins	Raspberry Pi pins
GND	Ground
Vcc	5V
Vss	Ground
RS	GPIO 25
R/W	Ground
EN	GPIO 24
DB4	GPIO 23
DB5	GPIO 22
DB6	GPIO 21
DB7	GPIO 14
LED+	5V
LED-	Ground

TABLE 0: Raspberry Pi to LCD connections

5 SOFTWARE SETUP

The following commands will install wiring pi module.

```
sudo apt-get install git-core
sudo apt-get update sudo apt-get upgrade
cd git clone git ://git.drogon.net/wiringPi
cd /wiringPi
./build
```

6 PROGRAMMING OF RASPBERRY Pi

- 1) The code is written in C language by importing the wiring Pi library.
- 2) WiringPi is a PIN based GPIO access library written in C for the BCM2835, BCM2836 and BCM2837 SoC devices used in all Raspberry Pi.
- 3) Save the following code in a file called calculatorpi .

```
https://github.com/rohithreddy0087/Calculator-using-Raspberry-Pi/blob/master/codes./Ccode
```

- 4) Run the program using following command.

```
gcc -o calculatorpi calculatorpi.c -lwiringPi -lwiringPiDev
```

7 SPECIFICATIONS OF CALCULATOR

- 1) Any number of inputs can be given to the calculator with any operations between the operands.

- 2) The input can be a decimal number also and can be a n digit number.
- 3) If more than two inputs is given, it performs calculation of first two operands and the obtained result is used for next calculation with third operand and so on.
For example if $2+3*4$ is given it first adds $2+3=5$ and this 5 is multiplied to 4 and the final result will be shown as 20.
- 4) The result of the given input calculation along with the calculation entered is displayed on the LCD display for 4s. After 4s we can enter new calculation.

8 CONCLUSIONS

A simple calculator with basic operations is made using a Raspberry Pi. GPIO pins of the Pi are used in making the hardware interface with the LCD. Using C programming and wiring Pi, we can write code for the calculator by importing necessary libraries.