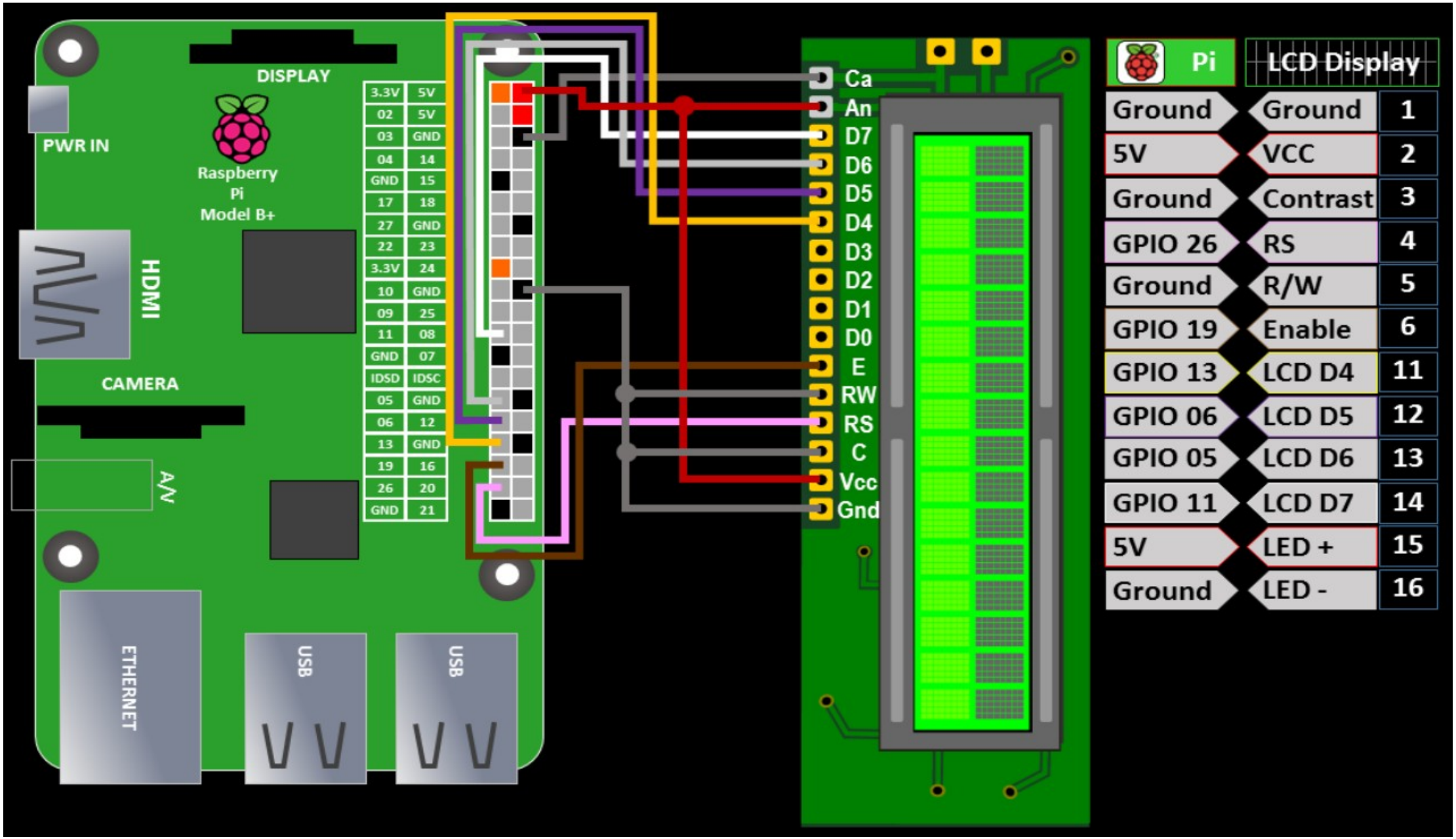
Experiment-10

1. Interface LCD with Raspberry Pi 4

9. Interface LCD with Raspberry Pi 4

```
import smbus
import time
# Define LCD parameters
LCD_WIDTH = 16  # Maximum characters per line
# Define some device parameters
I2C_ADDR = 0x27  # I2C device address
LCD_CHR = 1  # Mode - Sending data
LCD_CMD = 0  # Mode - Sending command
LCD_LINE_1 = 0x80  # LCD RAM address for the 1st line
LCD_LINE_2 = 0xC0  # LCD RAM address for the 2nd line
LCD_BACKLIGHT = 0x08  # On
# LCD_BACKLIGHT = 0x00  # Off
ENABLE = 0b00000100  # Enable bit
# Timing constants
E_PULSE = 0.0005
E_DELAY = 0.0005
# Open I2C interface
bus = smbus.SMBus(1)  # Rev 2 Pi uses 1
def lcd_byte(bits, mode):
    # Send byte to data pins
    bits_high = mode | (bits & 0xF0) | LCD_BACKLIGHT
    bits_low = mode | ((bits << 4) & 0xF0) | LCD_BACKLIGHT
    # High bits
    bus.write_byte(I2C_ADDR, bits_high)
    lcd_toggle_enable(bits_high)
 # Low bits
    bus.write_byte(I2C_ADDR, bits_low)
    lcd_toggle_enable(bits_low)

def lcd_toggle_enable(bits):
    # Toggle enable
    time.sleep(E_DELAY)
    bus.write_byte(I2C_ADDR, (bits | ENABLE))
    time.sleep(E_PULSE)
    bus.write_byte(I2C_ADDR, (bits & ~ENABLE))
    time.sleep(E_DELAY)

def lcd_string(message, line):
    # Send string to display
    message = message.ljust(LCD_WIDTH, " ")

    lcd_byte(line, LCD_CMD)

    for i in range(LCD_WIDTH):
        lcd_byte(ord(message[i]), LCD_CHR)

if __name__ == '__main__':
    try:
        while True:
            lcd_string("Hello, World!", LCD_LINE_1)
            lcd_string("Raspberry Pi", LCD_LINE_2)

            time.sleep(2)  # 2 second delay

            lcd_string("LCD Interfacing", LCD_LINE_1)
            lcd_string("with Python", LCD_LINE_2)

            time.sleep(2)  # 2 second delay

    except KeyboardInterrupt:
        pass

    finally:
        lcd_string("", LCD_LINE_1)
        lcd_string("", LCD_LINE_2)

        time.sleep(2)
```


DISPLAY
PWR IN
Raspberry
Pi
Model B+
HDMI
CAMERA
A/V
ETHERNET
USB
USB
3.3V 5V
02 5V
03 GND
04 14
GND 15
17 18
27 GND
22 23
3.3V 24
10 GND
09 25
11 08
GND 07
IDSD IDSC
05 GND
06 12
13 GND
19 16
26 20
GND 21
Ca
An
D7
D6
D5
D4
D3
D2
D1
D0
E
RW
RS
C
Vcc
Gnd
Pi
LCD Display
Ground Ground 1
5V VCC 2
Ground Contrast 3
GPIO 26 RS 4
Ground R/W 5
GPIO 19 Enable 6
GPIO 13 LCD D4 11
GPIO 06 LCD D5 12
GPIO 05 LCD D6 13
GPIO 11 LCD D7 14
5V LED + 15
Ground LED - 16