

Experiment: Control LED and Measure Analog Value using RP2040 (C Program)

Aim: To control LED brightness and measure analog input value using ADC on RP2040 using C.

Theory: RP2040 includes a 12-bit ADC that converts analog voltage to a digital value. PWM varies LED brightness based on duty cycle.

Procedure:

- 1. Connect the potentiometer middle terminal to GP26 (ADC0).*
- 2. Connect the side terminals to 3.3V and GND.*
- 3. Write the C program in Pico SDK environment.*
- 4. Compile and generate .uf2 file.*
- 5. Flash it to Raspberry Pi Pico.*
- 6. Rotate the potentiometer and observe LED brightness variation.*

C Program:

```
#include "pico/stdlib.h"
#include "hardware/pwm.h"
#include "hardware/adc.h"

int main() {
    stdio_init_all();
    adc_init();
    adc_gpio_init(26);
    adc_select_input(0);

    gpio_set_function(25, GPIO_FUNC_PWM);
    uint slice = pwm_gpio_to_slice_num(25);
    pwm_set_clkdiv(slice, 4.0f);
    pwm_set_wrap(slice, 65535);
    pwm_set_enabled(slice, true);

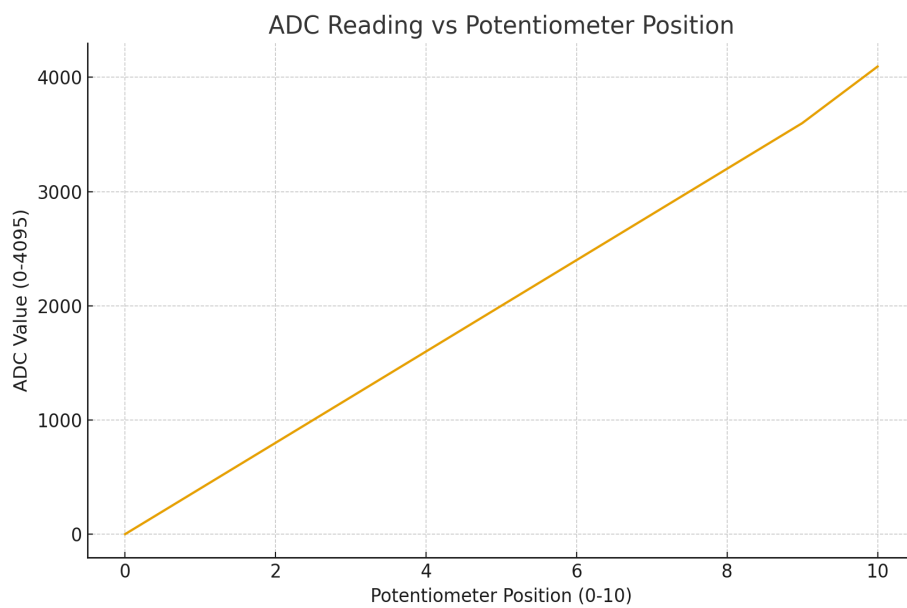
    while (1) {
        uint16_t adc_value = adc_read();
        uint16_t pwm_value = adc_value * 16;
        pwm_set_gpio_level(25, pwm_value);
        sleep_ms(50);
    }
}
```

Observation Table:

<i>Position</i>	<i>ADC Value</i>	<i>LED Brightness</i>
<i>0</i>	<i>0</i>	<i>Low</i>
<i>1</i>	<i>400</i>	<i>Low</i>
<i>2</i>	<i>800</i>	<i>Low</i>

3	1200	Low
4	1600	Medium
5	2000	Medium
6	2400	Medium
7	2800	Medium
8	3200	High
9	3600	High
10	4095	High

Graph:



Output:

Sample Output:

ADC Value changes with potentiometer movement.

LED brightness increases as ADC value increases.

Result: The LED brightness varied according to the analog input confirming correct ADC and PWM operation.