

# ESP32 Web Controller — Project Documentation

## Overview

This project uses an **ESP32 board** as a local web server to remotely control peripherals via Wi-Fi. It provides a simple **web interface** to manage the following devices:

- **NeoPixel LED strip** (color & count)
- **Buzzer** (single beeps, musical notes & melodies)
- **OLED screen** (custom messages & status display)
- **DHT11 sensor** (temperature & humidity)

All interactions are done wirelessly through a browser by connecting to the ESP32's Wi-Fi access point.

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## Wi-Fi Access Point

The ESP32 acts as a Wi-Fi access point with the following credentials:

- **SSID:** ESP32 Wifi
- **Password:** 123456789

Once connected, you can access the web interface at:  
**http://192.168.4.1**

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## Web Interface Features

### 1. LED Control

- **Color sliders** allow you to set the RGB values (0–255) of the NeoPixel LED strip.
  - **LED count selector** lets you choose how many of the 12 LEDs should light up with the selected color.
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### 2. Buzzer & Music

- **“Beep Beep” button** triggers two short consecutive beeps at 500 Hz.
  - **Musical Notes:** Play individual notes (C4 to C5) with a button interface using PWM control.
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### 3. OLED Display

- A text field allows displaying a custom message (max ~20 characters) on the OLED screen.
  - The OLED also shows feedback/status messages for every action performed (color change, note played, etc.).
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### 4. DHT11 Temperature Sensor

- A dedicated button lets you measure and display:
    - Temperature (in °C)
    - Humidity (in %)
  - The data is shown on both the webpage and the OLED screen.
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## Technologies Used

- **MicroPython**
  - **Microdot** (for lightweight web server)
  - **NeoPixel** (WS2812 LEDs)
  - **PWM** (for buzzer audio output)
  - **SSD1306** OLED display (via I2C)
  - **DHT11** temperature & humidity sensor
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## Status Feedback System

Every user action updates a "**Status**" section on the web page, and the same message is displayed on the OLED screen for instant feedback.

Example messages:

- Color updated
- LED count updated
- Note played: A4
- Temperature: 23°C | Humidity: 60%