Arduino DIY Calculator using a 4×4 Keypad and 16×2 LCD Display

Project Description

This project focuses on building a simple calculator using an **Arduino Uno**, a **4×4 membrane keypad**, and a **16×2 LCD display**. The keypad serves as the input device for entering numbers and arithmetic operations, while the LCD displays the entered values and final results. The Arduino microcontroller processes the input, performs calculations, and updates the display accordingly. This project helps in understanding basic interfacing of input/output devices with microcontrollers and developing simple mathematical operations using Arduino programming.

Components Used

1. 4×4 Keypad

- A 4×4 membrane keypad consists of **16 keys** arranged in a matrix of **4 rows and 4 columns**.
- When a key is pressed, a connection is established between a specific row and column, allowing the Arduino to detect the keypress.
- Used for numerical input and arithmetic operations in the calculator.

2. Arduino Uno

- A **microcontroller-based development board** that is programmable via USB.
- Provides multiple **digital and analog input/output pins** to interface with various components.
- Processes the keypresses from the keypad and performs arithmetic operations.

3. 16×2 LCD Display

- A **liquid crystal display** with **16 columns and 2 rows**.
- Displays numbers, arithmetic symbols, and results of calculations.
- Controlled via Arduino using a parallel interface (DB4-DB7 pins).

4. Jumper Wires

- Used for making **electrical connections** between the Arduino, keypad, and LCD display.
- Ensures proper signal transmission between components.

5. Resistor (1kΩ)

- Used for limiting current flow to **protect the LCD backlight** from damage.

Working Principle

1. The **keypad** is connected to the Arduino using **8 digital pins** (4 rows + 4 columns).
2. When a key is pressed, the Arduino detects which row and column are shorted, identifying the key.
3. The **LCD display** is connected using 6 pins (DB4-DB7, Enable, and RS) to receive data from the Arduino.
4. The **Arduino processes** the input from the keypad and performs the required arithmetic operation (+, -, ×, ÷).
5. The **result is displayed** on the 16×2 LCD screen.
6. The circuit can be simulated using **TinkerCAD software** before hardware implementation.

This project provides hands-on experience in microcontroller programming, hardware interfacing, and embedded systems development.