Department of Electronics and Communication Central University of Rajasthan, Ajmer

Subject: MICROCONTROLLERS AND EMBEDDED SYSTEM LAB
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Experiment No.

Name – Shubham Sharma Roll No - 2021BTBME015 Date: 20/01/2024

Title: Introduction to 8051 development board.

Material: Development board, LCD module, Power adapter, Programmer, etc.

Theory:

Introduction:

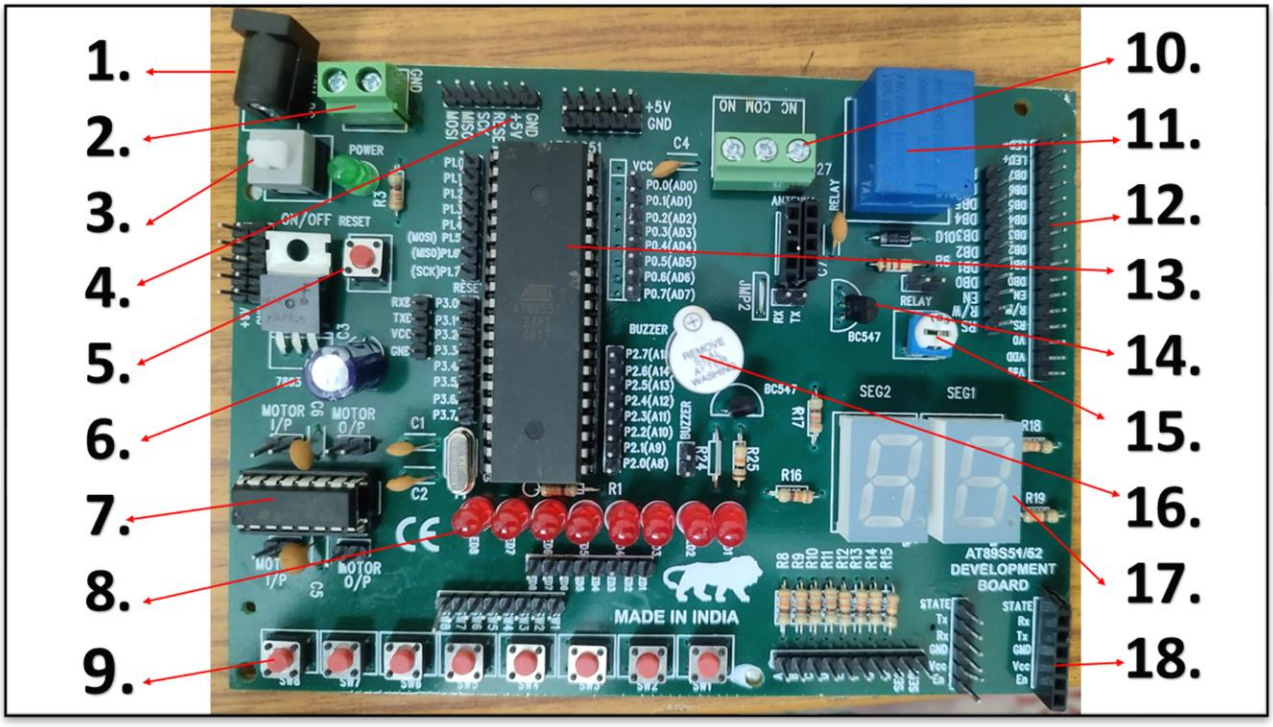
In the year 1981, Intel Corporation introduced an 8-bit microcontroller. It was called as 8051. This microcontroller used to have 128 bytes of RAM, 4k bytes of on-chip RIM, two timers, one serial port, and 4 ports being 8-bits wide each, all on the chip. The 8051 is an 8-bit processor, which means that the CPU can work on only 8-bits at a time. For data larger than 8-bits, it is broken in pieces of 8-bits to be processed.

The 8051 became popular mainly after Intel allowed other manufacturers to make and market 8051 in other flavours, as far as they remained code-compatible with the 8051. One of which was 8051, the original member of the 8051 family. Intel referred to it as MCS-51.

The AT89S51/52 Development Board is a general-purpose, low-cost development board for Intel 8051-compatible family of 8-bit microcontroller AT89S51 manufactured by ATMEL.

The board is designed for general-purpose applications and includes a variety of hardware to exercise microcontroller peripherals. This MCU board's construction includes a relay, 2-seven-segment displays, a buzzer, an L293D motor driver, a Bluetooth insert port, an 8-input switch, with output indication etc.

The 8051 development board components:



1. Power Jack, 9V/12V 1A AC/DC Adaptor
2. DC Voltage Jack (2-terminal)
3. Push ON Push OFF Switch
4. ISP Connector
5. Reset switch
6. Electrolytic Capacitor
7. Motor Driver
8. 8 LEDs
9. Push to ON switch
10. DC Voltage Jack (3-terminal)
11. Relay
12. LCD Male Connecting pins
13. 8051 IC
14. BC547 Transistor
15. Potentiometer
16. Buzzer
17. 7 Segment Display
18. Bluetooth Module female connector

Description of components used:

1. **Power Jack, 9V/12V 1A AC/DC Adaptor-** This is a socket or connector made to accept an external power supply plug. Usually cylindrical in shape, it has an outside sleeve for ground and a central pin for positive voltage. The power supply may absorb both alternating current (AC) input from wall outlets and convert it to direct current (DC) required by electronic devices.
2. **DC Voltage Jack (2-terminal)-** An 8051-development board normally has two connections on a 2-terminal DC voltage jack: one for ground (GND) and one for positive voltage (VCC). This development board is frequently powered externally using this kind of DC socket for 9V voltage supply.
3. **Push ON Push OFF Switch-** The term "Push ON Push OFF" switch, describes a switch that, when pushed and released, holds its current state (either ON or OFF). The user must push the switch once to turn it ON and again to turn it OFF. These switches are frequently found in a variety of electronic devices and circuits where the user wants to control a device's power state with a single switch. They offer a convenient way to turn on or off power without having to hold the switch constantly.
4. **ISP Connector-** An In-System Programming (ISP) connector or header on a microcontroller or microcontroller-based device is sometimes referred to as a "ISP connector". ISP is a technique for programming or updating a device's firmware or software while it is still mounted on the target circuit board or system. A programming device, like a programmer, can be connected to the microcontroller via the ISP connector in order to program or debug it.
5. **Reset switch-** A physical button or switch on an electrical circuit or device that, when pressed, starts a process to restart the circuit or reset certain elements is called a reset switch. The reset switch is frequently used to fix unwanted faults, fix system issues, or restart a system under control. The microcontroller or other related components get a signal from the reset switch when it is pressed, starting a reset sequence. This could entail restoring the system to a known state, erasing volatile memory (RAM), and restarting the device's operating system.
6. **Electrolytic Capacitor-** An electrolyte acts as one of the conducting plates of an electrolytic capacitor, which allows for a high capacitance in a relatively small volume. These capacitors are often found in power supply circuits, audio systems, and other electronic equipment. They are especially well-suited for applications requiring high capacitance values.
7. **Motor Driver-** An electronic device or circuit that regulates an electric motor's direction and movement is called a motor driver. It acts as a bridge between a microprocessor and the motor, providing the electrical signals required to operate the motor. Motor drivers are widely utilized in many different fields, such as automation, robotics, and electric cars.
8. **LEDs-** Semiconductor devices known as Light Emitting Diodes (LEDs) release light when an electric current passes through them. An anode and a cathode are parts of the semiconductor materials that make up LEDs. Electrons in the semiconductor recombine with

holes when a voltage is applied across the anode and cathode, releasing energy in the form of light.

9. **Push to ON switch-** Sometimes referred to as a "Push to ON" switch, it is a switch type that is ordinarily in the OFF position and only turns ON when the button is pressed. When you let go of the button, the switch goes back to being in the off position. These switches are used when temporary connection is required.
10. **DC Voltage Jack (3-terminal)-** This type of DC jack is used to facilitate additional functionalities beyond a standard two-terminal DC jack. The labels "NC," "COM," and "ON" indicate specific functionalities associated with each terminal, where “NC” is Not Connected, “COM” is Common, “ON” is Normally Open.
11. **Relay-** An electromechanical device called a relay is used to regulate the amount of electrical current that flows across a circuit. It is made up of one or more sets of contacts and a coil. The contacts move as a result of an electrical current flowing through the coil, opening or closing the circuit to which they are connected. Relays are frequently employed in a variety of applications to isolate the controlled load from the control circuit by using low-power signals to control high-power devices.
12. **LCD Male Connecting pins-** The interface that enables you to attach an LCD (Liquid Crystal Display) module to the development board is known as the LCD connector on an 8051-development board. The connector usually consists of a set of headers or pins that fit the LCD module's pinout specifications. This connector serves as an electrical contact between the LCD for information display and the microcontroller on the 8051-development board.
13. **8051 IC-** One of the first and most well-known microcontrollers was the 8051, commonly referred to as the MCS-51. These microcontrollers were given the 80C51 designation, which indicates that CMOS technology forms the basis for them. Since it is an 8-bit microcontroller, the data bus is also 8-bit. It can therefore process eight bits at once. It is utilized in many different embedded systems, including power tools, robotics, automotive, telecom, and remote controls.
14. **BC547 Transistor-** A popular general-purpose NPN bipolar junction transistor (BJT) for switching and amplification in electrical circuits is the BC547. As one among a number of transistors, the BC547 is particularly well-known for having high gain and low noise.
15. **Potentiometer-** As known by other names like variable resistor or "pot," a potentiometer is a three-terminal electronic device that has a programmable resistance. It is frequently used to supply an analog input to a microcontroller so that position-based variable voltage measurements are possible.
16. **Buzzer-** An electronic component known as a buzzer emits sound when an electric current is sent through it. To control sound generation using programmed logic, a buzzer on an 8051-development board is interfaced by attaching it to one of the microcontroller's digital output pins.
17. **7 Segment Display-** A 7-segment display is a type of electronic display device used to represent decimal numbers. It is made up of seven separately addressable portions that are placed in a rectangle and have independent on/off buttons. Selective illumination of the segments allows for the display of various numbers (0-9) as well as some letters.

18. **Bluetooth Module female connector-** A Bluetooth module can be connected to the microcontroller and communication can be established between the 8051 and the Bluetooth module. Bluetooth modules normally exchange data via serial transmission (UART). The UART pins present on the 8051-development board are- STATE, Rx, Tx, GND, Vcc and En.

Conclusion- By summing up, we can say that the 8051-development board is a great tool for practical research and experimentation with microcontroller-based systems. A broad learning experience including power supply, input/output interface, programming, and control is made possible by the variety of components and how well they are integrated into the board's architecture. This provides a strong basis for future experimentation in microcontroller and embedded systems.