**MULTIPURPOSE CALCULATOR**

**OBJECTIVE:**

The aim of this project is to construct a portable device with two modes, one as a arithmetic calculator and another as a BMI calculator.

**FEATURES:**

1.) Calculator is a 4-Digit calculator. Functions like Addition, Subtraction, Multiplication and Division(+,-,/,\*) can be performed on any numbers using this calculator. User Inputs the numbers using 4x4 keypad. Result is displayed on the 16x2 lcd.

* You can give any 4 digit number as a input.
* You can press '*ON/C*' button at any time to reset the calculator.
* 4 functions are implemented i-e addition, subtraction, multiplication and division.
* Error messages are displayed if result is greater than 9999(ie 4 digit number).

2.) BMI calculator is a mode which calculate the BMI of a user by taking their height and weight.

* You can give height in ‘cm’ and after pressing ‘+’ you can give the weight in ‘kg’ for your BMI.
* BMI is displayed with the message according to your BMI. For example a BMI of 25.0 or more is displayed “overweight”, while “normal” is displayed for 18.5 to 24.9 and below 18.5 is displayed “underweight”.

**Block diagram:**

MANUAL RESET

LCD DISPLAY

PIC MICRO CONTROLLER

CRYSTAL OSCILLATOR

KEYPAD FOR INPUT

BUTTON FOR TWO MODES

**Working of each block:**

**PIC16F887 MICROCONTROLLER:**

It is an 8bit microcontroller

**LCD:**

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. It is often utilized in battery powered electronic devices because it uses very small amounts of electric power. Here we use a **16x2 character LCD display(LM016L)** which works on any microcontroller. The LCD Memory has two 8-bit register **IR (instruction register) and DR (data register) register**. The IR stores instruction codes, such as display clear and cursor shift, and address information for display data. The DR temporarily stores data to be written into DDRAM or CGRAM and temporarily stores data to be read from DDRAM or CGRAM. The DR is also used for data storage when reading data from DDRAM or CGRAM. By the **register selector (RS)** signal, these two registers can be selected. The **RW(read/write)** pin is used to select whether to read or write. **The E(enable)** pin used to latch the data present on the data pins. A high-to-low edge is needed to latch the data.**VSS** is always grounded and **VDD** is given a power supply of 5V. **VEE** acts as a potentiometer for variable voltage.

**KEYPAD MATRIX:**

A keypad is a set of buttons arranged in a block or "pad" which bear digits, symbols or alphabetical letters. Pads mostly containing numbers are called a keypad. Numeric keypads are found on [alphanumeric keyboards](https://en.wikipedia.org/wiki/Alphanumeric_keyboard) and on other devices which require mainly numeric input such as [calculators](https://en.wikipedia.org/wiki/Calculators), [push-button telephones](https://en.wikipedia.org/wiki/Push-button_telephone), vending machines, ATMs, Point of Sale devices, [combination locks](https://en.wikipedia.org/wiki/Combination_locks), and [digital door locks](https://en.wikipedia.org/wiki/Digital_door_lock).

**RESET:**It generates a reset signal when power is applied to the device. It ensures that the device starts operating in its original state.

**CRYSTAL OSCILLATOR:**An electronic circuit that is used to generate an electrical signal of precise frequency by utilizing the vibrating crystal’s mechanical resonance made of [piezoelectric material](http://www.edgefx.in/piezoelectric-sensor-switch-working/). This crystal oscillator is used to generate clock pulses required for the synchronization of all the internal operations. It operates at a frequency of 20MHz in this project.

**BUTTONS:** two buttons is used for switching between two modes, calculator and BMI calculator.

**Flow Chart:**

START

If 2nd button

If 1st button

Select mode

Enter height

Enter first number

Display error on LCD

Press ‘+’

Enter the function

If result is greater

Enter weight

Enter second number

Press ‘=’ for result

Press ‘=’ for result

Display BMI with message

Display result

STOP

**Applications:**

* It can be used to perform multidigits operations like addition, subtraction, multiplication and division.
* Other than basic calculation it can calculate BMI of a person.
* Acts as a basic model for a more complex scientific calculator.

**Future enhancements:**

* It can be modified to perform more scientific functions such as exponent, logarithm, surds, trigonometric functions.
* It can be used to take more than four digit input.
* It can be more multi-functional (ie. more than two modes can be there).