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# Smoke Detection System By Using PIC Microcontroller

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**Abstract :** Smoke is detected by the smoke sensor. The smoke sensor produces the analog voltage corresponding to the amount of smoke detected. This analog voltage is sent to PIC microcontroller. Three conditions are defined according to the amount of smoke detected. These conditions are shown by both different coloured light emitting diodes and liquid crystal display simultaneously. The required program is written in Pic BASIC Pro language in MicroCode Studio software. The program is compiled and downloaded into PIC18F4550 microcontroller via GTP USB Lite programmer.

Key words: PIC18F4550 microcontroller, Pic Basic Pro language.

### INTRODUCTION

Smoke sensor is a device that senses smoke, typically as an indicator of fire. Commercial and residential security devices issue a signal to a fire alarm control panel as part of a fire alarm system, while household detectors, known as smoke alarms, generally issue a local audible or visual alarm from the detector itself. The analog smoke/LPG/CO gas sensor (MQ2) module utilizes an MQ-2 as sensitive component and has a protection resistor and an adjustable resistor on board. The MQ-2 gas sensor is sensitive to LPG, i-butane, propane, methane, alcohol, hydrogen and smoke. It could be used in gas leakage detecting equipments in family and industry. The resistance of the sensitive component changes as the concentration of the target gas changes.

### **COMPOENTS REQUIRED**

**1.PIC Microcontroller :**-PIC18F4550 is an 8-bit microcontroller manufactured by Microchip with nano-Watt technology with enhanced flash, USB, and high-performance. It is a 40-pin microcontroller that comes with several features such as memory endurance, self-programmability, extended instruction set, enhanced CCP module, and addressable USART and 10-bit ADC (Analog to digital converter). It consists of 4 timers or an external oscillator is interfaced for clocking purposes, 13 channels for ADC, ADC comparators, and other peripherals. It is an 8-bit popular microcontroller available in various packages like QPF, QPN, and DIP. It is selected based on the type of project and requirement. The PIC18F4550 portable Portable microcontroller chip form is shown below. It is very simple to program the PIC18F4550 controller and easy to interface with many peripheral devices using 35 programmable I/O pins. With the feature of the USB interface, it provides hassle-free communication between the controller and the PC. The watchdog timer can be reset to use the systems without any human interface.



**2.Smoke Sensor :-**Smoke sensor is a device that senses smoke, typically as an indicator of fire. Commercial and residential security devices issue a signal to a fire alarm control panel as part of a fire alarm system, while household detectors, known as smoke alarms, generally issue a local audible or visual alarm from the detector itself. The analog



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smoke/LPG/CO gas sensor (MQ2) module utilizes an MQ-2 as sensitive component and has a protection resistor and an adjustable resistor on board. The MQ-2 gas sensor is sensitive to liquefied petroleum gas (LPG), i-butane, propane, methane, alcohol, hydrogen and smoke. It could be used in gas leakage detecting equipments in family and industry. The resistance of the sensitive component changes as the concentration of the target gas changes.



Fig. (2) The photograph of smoke sensor module

**4.Smoke Detection Unit:-** This unit is designed to detect the smoke. Pin 1 (+5V) of smoke sensor is connected to DC +5V and pin 4 (GND) is connected to ground. Analog output voltage is taken from pin 3 (AOUT). The amount of analog output voltage depends upon the amount of detect smoke. This pin 3 (AOUT) is connected to pin 2 (AN0) of PIC18F4550 microcontroller

**5.Microcontroller Control Unit:-** This unit controls the whole operation of the system. PIC18F4550 Pin 11 (VDD) and Pin 32 (VDD) are connected to DC +5 V and Pin 12 (VSS) and Pin 31 (VSS) are grounded. A 4 MHz crystal oscillator is fixed at pin 13 (OSC1) and pin 14 (OSC2). Two 22 pF capacitors are connected to the crystal oscillator and ground. Pin 1 (MCLR) is connected to DC +5 V through 10 k  $\Omega$  resistor. When RESET SWITCH is pressed, the pin 1 (MCLR) is grounded and the microcontroller is reset condition. Pin 2 (AN0) is connected to the pin 3 (AOUT) of smoke sensor. Pin 33 (RB0), pin 34 (RB1), pin 35 (RB2), pin 36 (RB3), pin 37 (RB4) and pin 38 (RB5) are connected to Pin 11 (DB4), Pin 12 (DB5), Pin 13 (DB6) and pin 14 (DB7), pin 6 (E) and pin 4 (RS) of liquid crystal display (2004A) respectively. Pin 15 (RC0), Pin 16 (RC1) and Pin 17 (RC2) of PIC16F877A are connected to anodes of GREEN LED, YELLOW LED and RED LED through 100  $\Omega$  resistor respectively.

**6.Buzzer:-** This section interfaces one audible piezo electric buzzer with the controller. The controller activates the buzzer whenever there is any fault appears in any of the channel.



#### **Design and Construction**

"Smoke Detection System By Using PIC Microcontroller" is composed of the following section:



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1)Regulated Power Supply unit 2) Smoke Sensor Unit 3) Microcontroller Control Unit 4) Indicator Unit (Buzzer)

#### **Block Diagram**



### CONCLUSION

Smoke detection system is very important in many places such as buildings, offices and factories. In this work, smoke sensor (MQ2) and PIC18F4550 microcontroller are used. It is also suggested to carry out further works by using other smoke sensors and electronic devices.

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