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Enhanced Wireless Control System for Smoke and Fire Detection

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Abstract: A **smoke detector** or **smoke alarm** is a device that detects smoke and issues an alarm to alert nearby people that there is a potential fire. Smoke alarms are self contained devices that incorporate a means of detecting a fire (smoke detector) and giving a warning (alarm). They are about the size of a hand and are normally fitted to the ceiling. They can detect fires in their early stages and give you those precious minutes to enable you and your family to leave your house in safety.

Index Terms : Smoke detector, Fire detection system, Microcontroller

1. Introduction:

A Wireless Detector Network is a wireless local area network, which is the linking of two or more electronics devices without using wires.It utilizes spread-spectrum or frequency modulation technology based on radio waves to enable communication between devices in a limited area, also known as the basic service set. This gives users the mobility to move around within a broad coverage area and still be connected to the network.[1]

2. Photoelectric Detectors

In a photoelectric smoke detector, a light source and light sensor are arranged so that the rays from the light source do not hit the light sensor. These detectors react quickly to visible smoke particles from smoldering fires, but are less sensitive to the smaller particles associated with flaming or very hot fires[2]

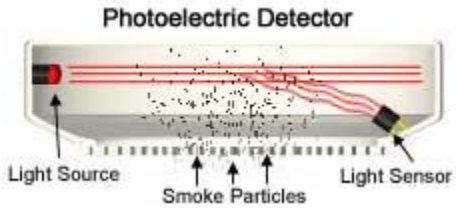

Figure 2(a): Photoelectric Detector

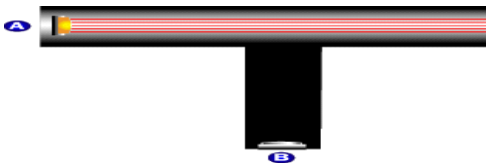

Figure 2(b): T shaped chamber

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3. System Overview of Fire Detection

The requirement for the project is to design and to create a functional smoke detector. After detecting smoke or a high temperature (potential fire), the detector sets on the appropriate alarm sound. The detector also transmits an RF signal to the other smoke detectors in the network so that those detectors, in turn, sound their alarm. Each detector is capable of sounding four different alarms. There is a smoke, temperature, low battery, and received alarm. The last alarm is implemented so that the origin of the smoke or fire is known.[3]

3.1 PIC Microcontroller

The microcontroller is the heart of the system. It receives inputs from the receiver, temperature sensor, smoke sensor, and low battery sensor, as well as outputting the appropriate signals and bits to the tone generator and transmitter

3.2 Low battery Sensor

The low battery sensor measures the amount of battery life remaining. When the battery life dips below 3.5V, the module enables smoke detector to emit the low battery alarm via tone generator.

3.3 Temperature Sensor

The temperature sensor sends an analog signal—proportional to the temperature—to the PIC microcontroller. The temperature threshold is set at 125°F.

3.4 Smoke Sensor

The smoke sensor provides a mean to detect smoke and to serve as an early fire warning. The basis of the smoke sensor is a T-shaped chamber (figure 2b) with an infrared LED that
emits a beam of light across the horizontal portion of the chamber. .[4]

3.5 Tone Generator and Speaker

The tone generator and speaker module emits the appropriate sound determined by the PIC microcontroller. There are four distinct alarms. The temperature alarm and smoke alarm both sound at 4 kHz; however, the temperature alarm is sounded at a higher volume level (with the use of a lower resistance than the smoke alarm). In addition, there is a detected signal alarm (smoke or fire detected at another detector) that sounds at 2 kHz. There is also a low battery alarm that sounds at 500 Hz.

3.6 Transmitter

The transmitter sends a signal to the other smoke detectors in the network in order to alert them to set on the audible alarm.

3.7 Receiver

The receiver is the counterpart to the transmitter. It receives the signal from the transmitters of the smoke detectors and relays that signal to the PIC microcontroller.

3.8 Block Diagram

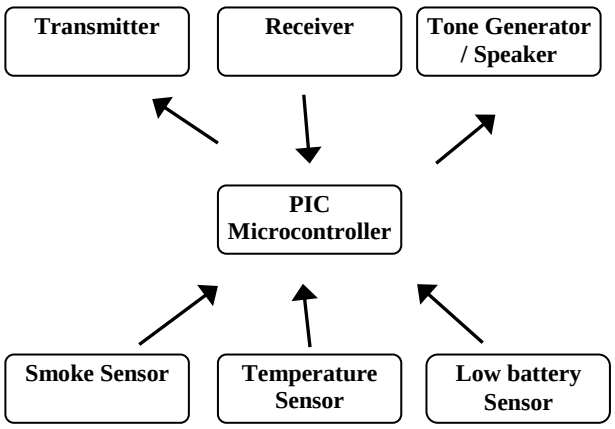
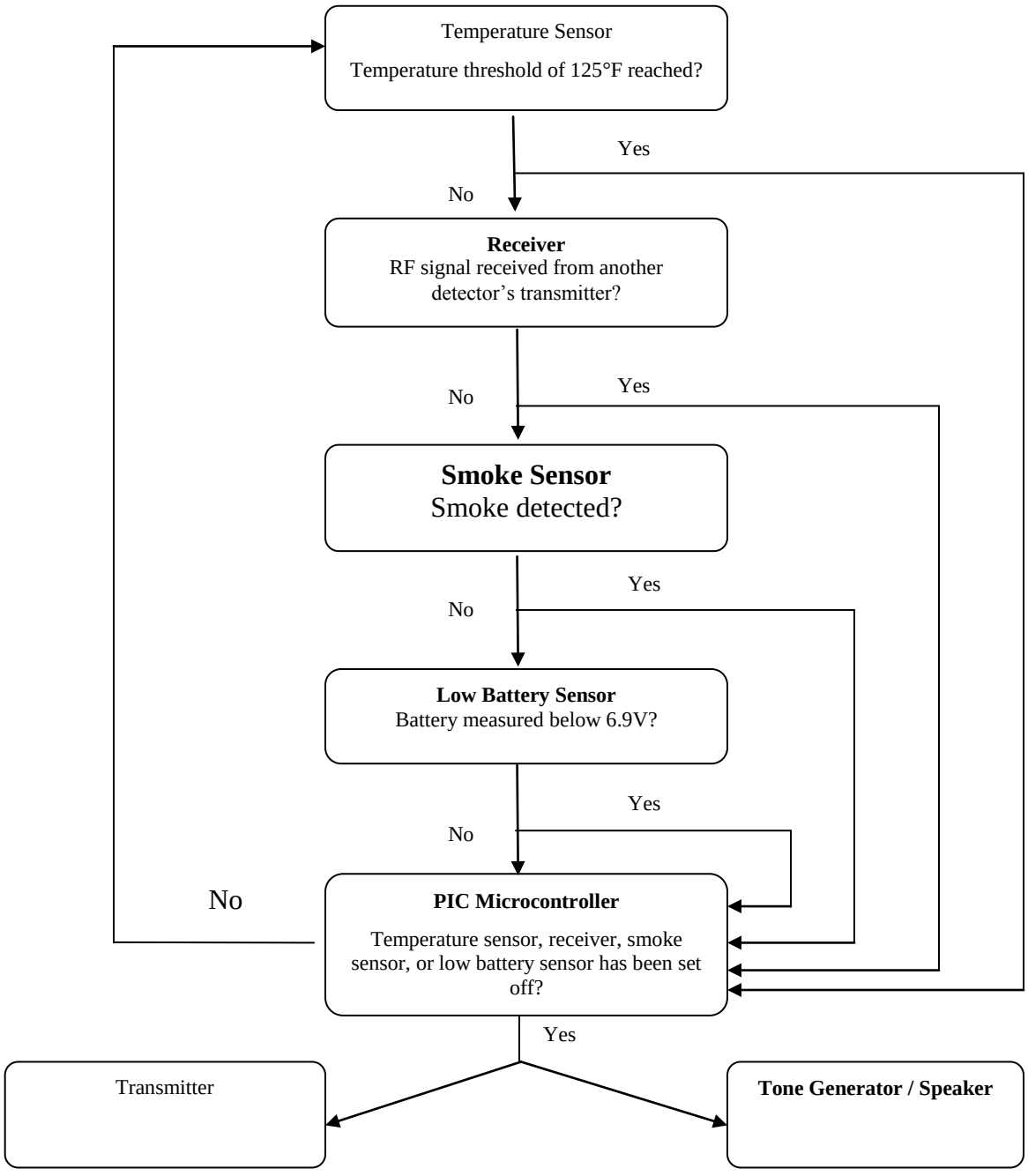
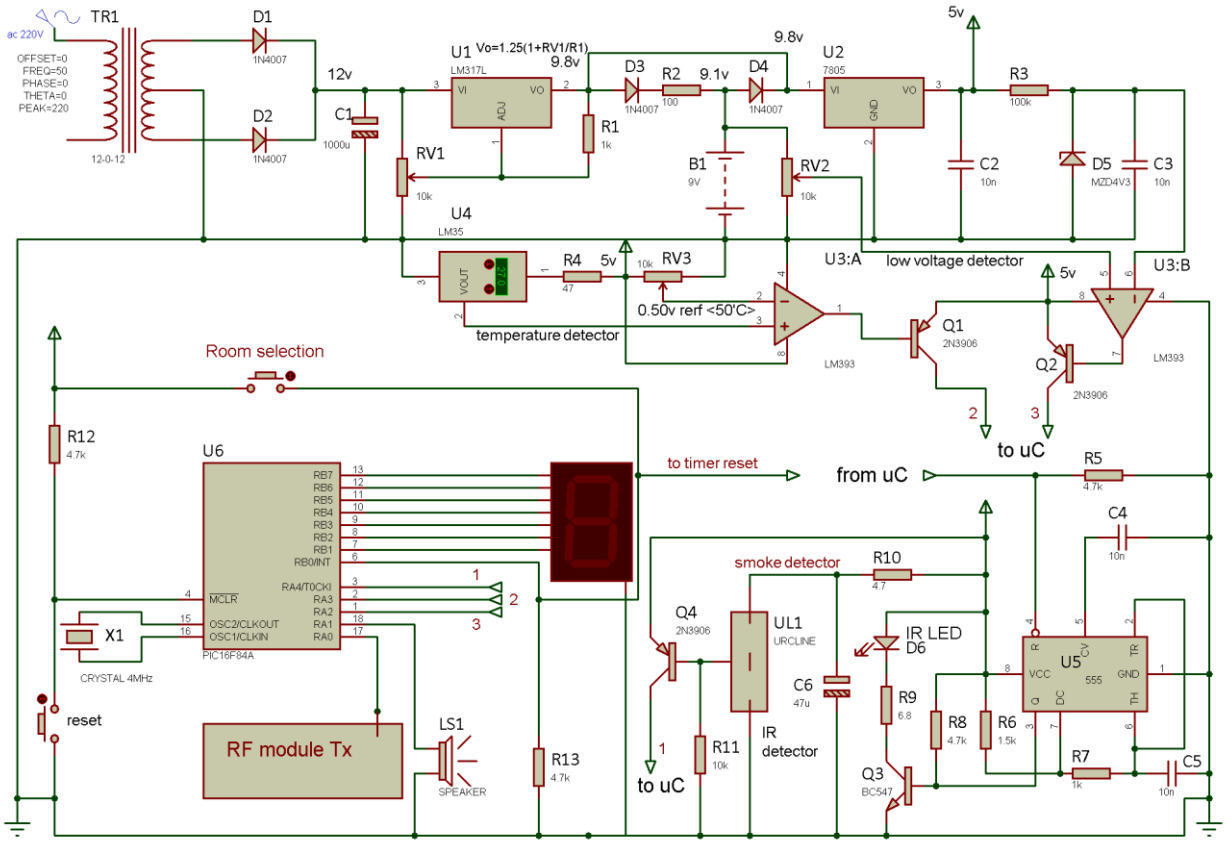


Figure 3.8: Detector Unit

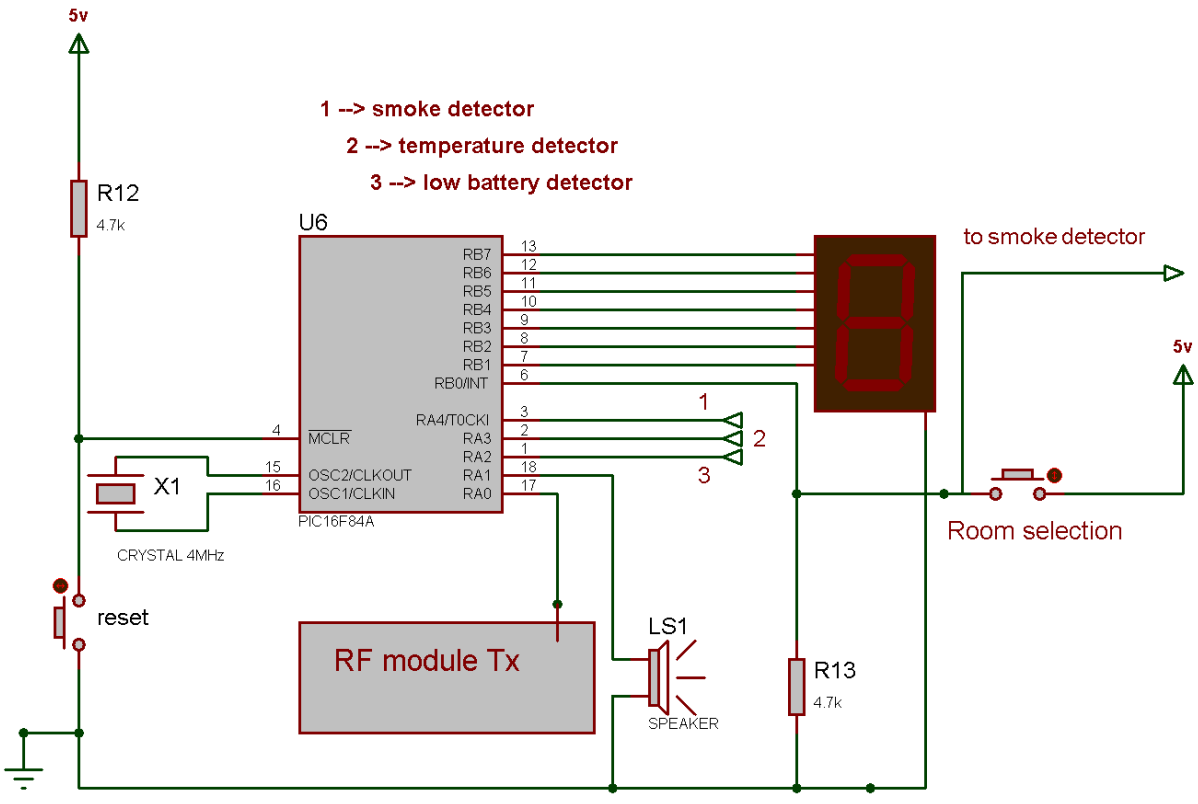
4. PIC Microcontroller Flow Diagram



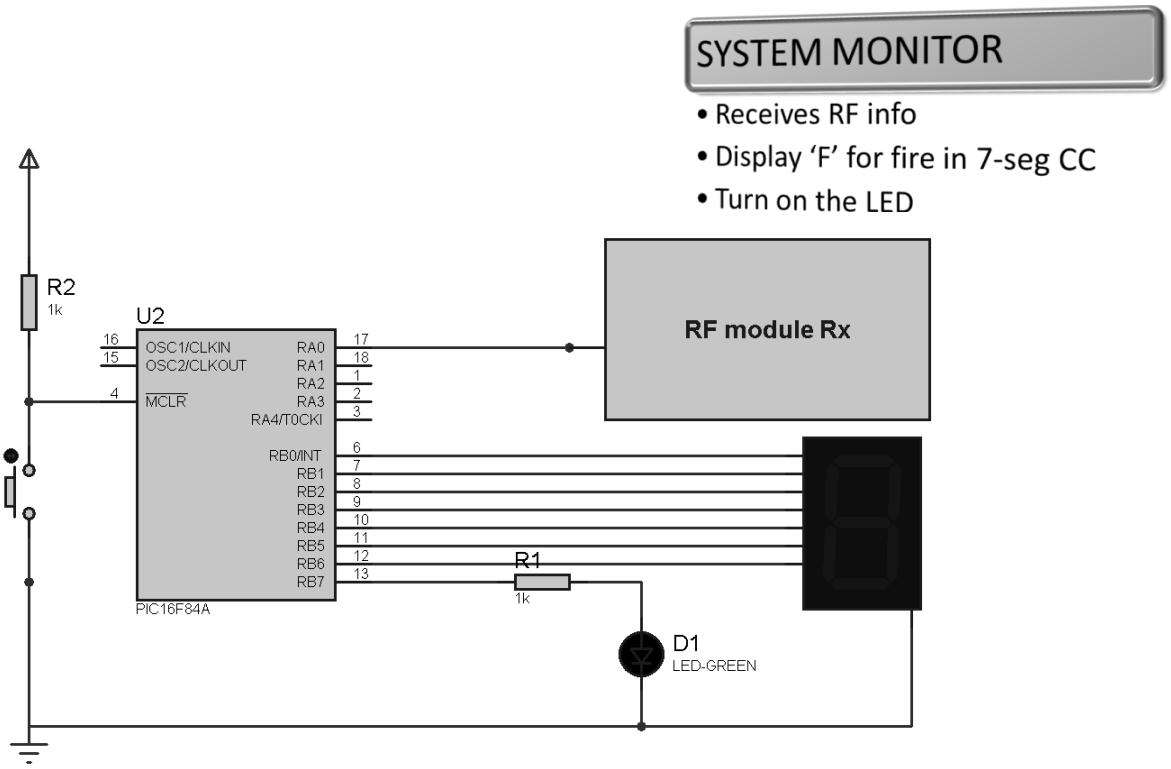
5.Total circuit diagram of the Remote Sensor:



6. Close view of the Microcontroller Interfacing:



7. Circuit diagram of the system monitor:



8.Conclusion:

We, the authors believe that our designed smoke detection system using optical smoke detector, so it is cost effective. The system is totally wireless, for that reason we don't have to face any wiring hassles. The system is microcontroller based software controlled and temperature sensor & smoke sensors, both are used, so the entire system is much more effective.

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