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DESIGN ON A NEW ALARM WHICH CAN BLAST THE AUTOMOTIVE GALSS

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ABSTRACT

With the single chip microcomputer PIC16F877A as the core,combined with MQ2 Smoke Detection circuit, DS18B20 temperature detection circuit, NRF24L01 Wireless Transceiver module, LCD1602 LCD Display Module, Infrared Remote Control circuit, Key Control circuit, Alarm circuit, Blast Automotive Glass Device circuit and other peripheral auxiliary circuit, constitute a the intelligent automatically Blast Automotive Glass Device system which contains multiple testing end and an execution end. Smoke and temperature alarm value can be adjusted through the keys and remote control. When the actual value from the smoke preseting value is less than 20 or the actual temperature value from the preseting value is less than 10, Teating end and executive end will send the first warning. If the actual temperature value or actual smoke value exceeds the corresponding preseting value,both ends will be alarming, within 10 seconds, if nobody take the initiative to close the alarm, the executive end will turn on the Blast Automotive Glass Device.In the monitoring,the executive end accepted data from each end of the detecting data every moment, and display through the LCD screen in order.

Keywords: PIC16F877A, Alarm, Automatic Blast Automotive Glass Device.

1. INTRODUCTION

In recent years, bus fire accident occurred frequently in some city, such as the June 5, 2009 Chengdu Bus Burning Accident, killed 27 people, injured 74 people; June 7, 2013 Xiamen Bus Fire Case, killed 47 people, injured 34 people; July 5, 2014 Hangzhou bus arson accident, injured 32 people. If fire occurs on the bus, the fire will burn very fast, that the passengers escape from the bus is difficult, each and every accident would cause heavy casualties and severe economic losses. According to the above situation, we developed the intelligent and automatic Blast Automotive Glass Device with effective early warning, and when the disaster occurs, it can turn on the Blast Automotive Glass Device timely, to help passengers escape quickly.

2. THE CIRCUIT STRUCTURE OF AUTOMATIC BLAST AUTOMOTIVE GLASS DEVICE

The Disaster Warning Automatic Blast Automotive Glass Device contains multiple testing end and an execution end, data transmitted between execution end and testing end by NRF24L01 wireless transceiver module. The testing ends are distributed at different monitoring point. The measured smoke and temperature value compare with the setting value, the results of the comparison and the measured value will be sent to the executive end, which can display the measured value in order by LCD1602 LCD Display Moudle. If the measured values of the actual smoke from the setting value are less than 20 or the actual temperature value from the preseting value of less than 10, teating end and executive end will send the first warning, and the executive end will light the corresponding yellow LED, the buzzer will honk intermittently. If the actual temperature value or actual smoke value exceeds the corresponding preseting value, the executive end will light the corresponding red LED, the buzzer will honk constantly. Within 10 seconds, if nobody takes the initiative to close the alarm, the executive end will turn on the Blast Automotive Glass Device, on the contrary, if someone closes the alarm system, the Blast Automotive Glass Device will not be turned on.

2.1. The introduction of single chip microcomputer PIC16F877A

N. commune samples were collected from PengXi County in Sichuan province. And the collected samples were washed and dried.

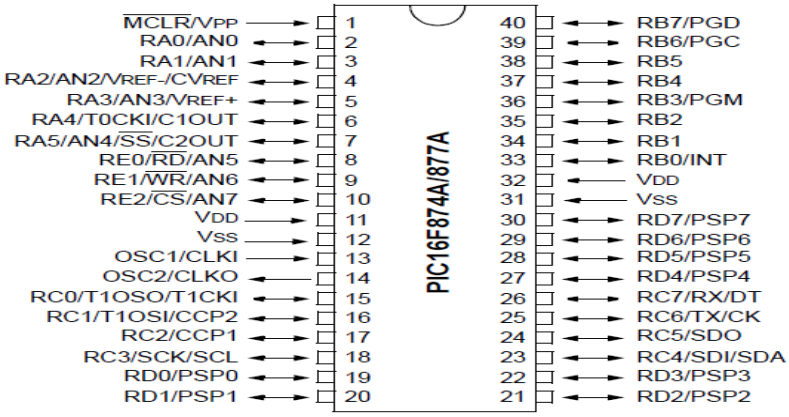

Figure 1. PIC16F877A

PIC series single chip microcomputer hardware system design is simple, the instruction is refined, has low power consumption, strong drive ability, fast running speed and other characteristics, which is a relatively easy to learn and use of MCU. As shown in Figure 1, the PIC16F877A has a total of 40 pins, according to the functions of the similar degree can be divided into four categories, the control class, clock class, power class and port class. Control class contains MCLR. Clock class contains OSC1 and OSC2. Power class contains VDD and VSS. Port class contains RA0-RA5, RB0-RB7, RC0-RC7, RD0-RD7, and RE0-RE2. OSC1 is the input end and OSC2 is the output end of the clock oscillator, are also the connection end of the peripheral oscillator. MCLR is the reset end; this pin is an active low Reset to the device. VDD is positive and VSS is negative. RA, RB, RC, RD, RE port can be used as input and output ports, part of which have the two or three functions. Here mainly to illustrate the functions involved in the Automatic Blast Automotive Glass Device. RA0 the second function is the AN0, which can receive analog signal. The RB0 pin the second function is the INT with interrupt function, low level interrupts.

2.2 The testing end circuit

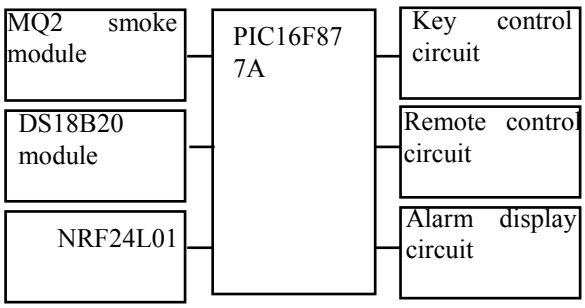

Figure 2. The testing end circuit

The testing end circuit is shown in Figure 2. Controlled by PIC16F877A, mainly includes the MQ2 smoke module, DS18B20 module, NRF24L01 Wireless Transceiver module, the key control circuit, the remote control circuit, and an alarm display circuit.

2.2.1 MQ2 smoke detection circuit

MQ2 smoke module can detect the liquefied gas, butane, propane, methane, alcohol, smoke etc. The smoke concentration can be detected ranges 100-10000ppm [PPM= (quality of solute quality / solution)*1000000], which with a lot of characteristics, such as wide range of detection, high sensitivity, high precision and fast response. 5V voltage power supply, which can output TTL level signal and analog signal, the analog signal is the range of 0~5V, the greater the smoke concentration value the greater the output voltage. In the circuit the PIC16F877A RA0 port can be set to receive analog signals, to judge the smoke concentration values.

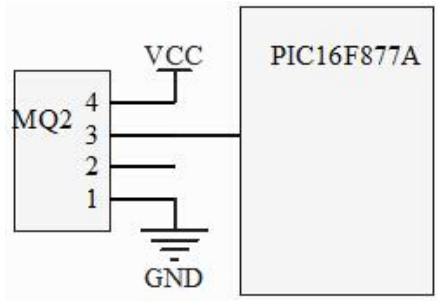

Figure 3. MQ2

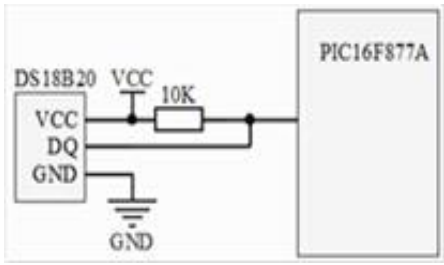

Figure 4. DS18B20

2.2.2 DS18B20 temperature detection circuit

DS18B20 has the characteristics of small volume, high precision, strong anti-interference ability. Temperature range from - 55 ℃ to + 125 ℃, the working voltage range 3-5.5 - V, multiple DS18B20s can be connected parallelly in only three lines. The single chip microcomputer can be programmed to readout the actual temperature measured by DS18B20. Temperature sensor can be programmed to set to 9 bit, 10 bit, 11 bit or 12 bit, respectively corresponding accuracy is 0.5℃, 0.25℃, 0.125℃ and 0.0625℃. As shown in Figure 4, this circuit, the DQ pin of DS1B20 is directly connected with the MCU, 5V power supply.

2.2.3 NRF24L01 wireless transceiver module

NRF24L01 works between 2.4 GHz to 2.4 GHz ISM band, which is a new type of single chip RF transceiver. It has built-in frequency synthesizer, bring power amplifier and oscillator module, and combined with enhanced Shock Burst in fusion, we can configure on the output power and the communication channel by program. NRF24L01,low power consumption, working current only 9mA when 6dBm transmitting power; when receiving, working current is only 12.3mA, a variety of low power modes make the energy saving design more convenient, can make data transmission way with single chip microcomputer through the SPI.

2.3 The executive end circuit

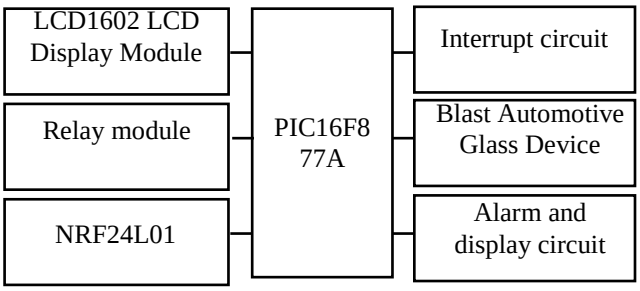

Figure 6. The executive end circuit

Executive end circuit structure diagram is shown in Figure 5, consists of LCD1602 LCD Display Module, relay module, NRF24L01 Wireless Transceiver module, interrupt circuit, Blast Automotive Glass Device and alarm and display circuit etc.

2.3.1 LCD1602 LCD display module

LCD1602 is a common display module, can show 2 rows at the same time, a total of 32 characters. It is a dot matrix LCD module specially used to display letters, numbers and symbols. LCD1602 LCD module has 16 pins. Its read and write operations, screen and cursor operation can be implemented through instruction. In the initialization of the LCD module, the display mode must be set first. When the LCD module displays characters, cursor is automatically shifted to the right, without human intervention. It should be judged whether the LCD module is in busy state. In the executive end circuit, LCD1602 up and down two rows were used to display real-time temperature and smoke value measured by testing end.

2.3.2 Relay module

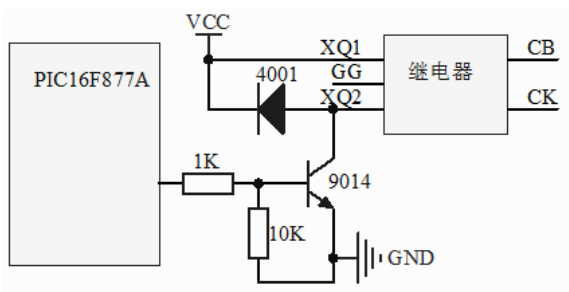

Figure **7.** Relay moudle

The relay module circuit as shown in Figure 7, the relay model is SRD-05VDC-SL-C 5V. The relay has 5 pins, the two ports of the coil XQ1 and XQ2, public port GG, normally open port CK, normally closed port CB. When the two ends of the coil are supplied by 5v DC power, the normally open port CK close, the normally closed port CB open. The public end (GG), the normally open port CK, the Blast Automotive Glass Device and 12V power supply are in series. Normally the Blast Automotive Glass Device has no electricity, when meets the danger, the Blast Automotive Glass Device system will send warning information, within 10 seconds, if nobody take the initiative to close the alarm, the corresponding pin of PIC will output the high level, the relay's coil is electrified, the normally open port CK close, the Blast Automotive Glass Device will be turned on, which can effectively help the passengers escape.

3. SOFTWARE DESIGN OF THE BLAST AUTOMOTIVE GLASS DEVICE SYSTEM

The system includes string mouth initialization program, NRF24L01 wireless transceiver program, smoke detection program, temperature detection program, LED and buzzer program, LCD1602 display program, infrared remote control program, key control program, interrupt program. The main workflow is shown in figure 8. Each testing end is distributed in different monitoring points inside the automotive, Each testing end is distributed in different monitoring points inside the automotive, which monitor the corresponding point temperature and smoke value in real-time, and make comparisons with the setting temperature alarm value and setting smoke alarm value. When the actual value from the smoke presetting value is less than 20 or the actual temperature value from the presetting value is less than 10, Treating end and executive end will send the first warning. If the actual temperature value or actual smoke value exceeds the corresponding presetting value, both ends will be alarming, within 10 seconds, if nobody take the initiative to close the alarm, the executive end will turn on the Blast Automotive Glass Device. In the monitoring, the executive end accepted data from each end of the detecting data every moment, and display through the LCD screen in order.

4. CONCLUSION

This thesis introduces the design on a new alarm which can blast the automotive glass man monitor smoke value and temperature value of the bus in real-time. When encountering danger, the device will be turn on timely, to help passengers escape quickly. The system is safe and reliable, which can simultaneously detect multiple monitoring points, easy operation and convenient for maintenance. Recently, the bus fire incident occurs frequently, this design will have good application prospects.

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