

FIRE ALARM SYSTEM CONTROLLED BY USING COMPUTER

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Abstract

This paper proposes the design and construction of fire alarm system which is controlled by 80C31 microcontroller. Computer is used to indicate situations of the system composed of 4 modes of working state, regular working mode, short circuit mode, open circuit of wiring signal mode, and fire mode. Graphic output states are displayed on personal computer, PC, by using software delphi, interfacing with microcontroller. Input signal coming from the normally opened warning devices such as heat detector, smoke detector and master key is sent into a detectable instrument to separate the mode of working state. After that, output signal is despatched to 80C31 microcontroller for analysis. This microcontroller can transfer data and display the situation of detector in 6 zone. Thus, the calculated all output data is exposed on PC. In case of fire mode, the data will be sent to PC and to bell simultaneously. Delay time of signal message can be changed directly and easily by PC. In addition, all information including mode of state, date and time are recorded to be database for further analysis that is benefit for the development of fire alarm system to possess both more efficiency and more accuracy. Comparing this controller with another conventional controller in the same specifications, the controller is used and installed easier because of working with no specific fire alarm devices, as well function of working mode and retardation are changed more comfortable because of program computer. Moreover, total price of this fire alarm system unit is significantly cheaper.

1 INTRODUCTION

Conventional fire alarm systems having hard wire layout and normally opened warning devices like heat detector and smoke detector in general specifications, have a good view in low price, but have a bad view in

1. low efficiency to warn and to communicate to human
2. difficult of maintenance
3. hard expansion and transformation of working
4. no record and no database to develop in the future

This fire alarm system is designed and built to solve those problem. The connection between warning devices and personal computer are dealt with microcontroller.

2 STRUCTURE AND FLOWCHART

The characteristic of this fire alarm system is divided into two portions, hardware and software. A detectable instrument and a microcontroller circuit are the main hardware component. The detectable instrument is the

hardwire system class B which wiring circuit possesses two cables. The transfer signal of itself is set up between each zone. The detectable instrument is utilized to send the signal of modes of working state comprising of regular working mode, short circuit mode, open circuit of wiring signal mode, and fire mode to microcontroller. The property of a constructed detectable instrument is shown in Figure 1. From the figure, 10 k Ω resistor known as end of line resistor is parallel connected with warning devices in each zone. This is useful for checking short circuit mode and open circuit mode. By the way, another modes use the principle of comparing voltage level of op-amp.

In case of normal working situation, transistor 2N5415 will be direct bias. Output voltage approximately equals 20.3 V which is as same as the voltage reference of the first op-amp of LM339 that is set up at 21 V.

In case of fire mode, sensor will detect signal of fire depending on its kind of detection. And then, output voltage level of transistor 2N5415 will be decreased until around 10.5 V. This exceeds voltage reference of the third op-amp, 4.82 V but not exceeds that of the second op-amp with 16.6 V. Consequently, output voltage of LM339 at leg thirteen and fourteen is 24 V.

In case of open circuit mode, transistor 2N5415 will be cut off. This provides the voltage of 2N5415 emitter at 22 V which is more than every voltage reference of LM339. Output voltage of all op-amp is at 24 V.

The last of working state, short circuit mode, make 2N5415 saturate. The output voltage at emitter is taken place near 3.26 V. This value exceed the setting voltage level of the fourth op-amp, 1.92 V. Only thirteen leg of LM339 has 24 V signal, thus.

After microcontroller makes a synopsis, output signal is transferred to computer by a serial port. Here is the software part that is use as a tool to display and to control all operations of fire alarm system. Simultaneously, all information such as the characteristic of working state, date and time in each part of day are recorded.

The main flowchart of fire alarm detection controlled by microcontroller is shown in Figure 2. When buffer transmit signal to PC, program will execute and delay time around 1 second by count the clock until complete 20 cycle. The delay time absolutely make sure that there is realistic fire. After that, the signal is despatched to bell or buzzer for warning the fire situation. Figure 3 illustrates the procedure of zero signal interruption. In general, the retardative time for reading and recording in memory is approximately 50 msec. This is useful for setting the retardation of alarm case. Moreover, users can comfortably change the appropriate delay time by PC.

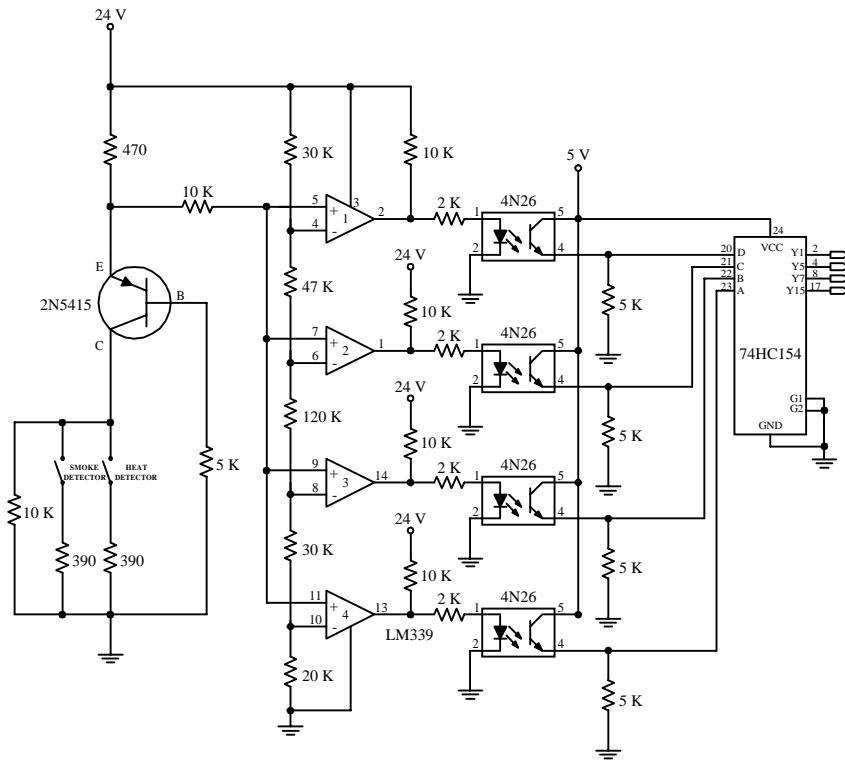


Figure 1 : Circuit of the detectable instrument

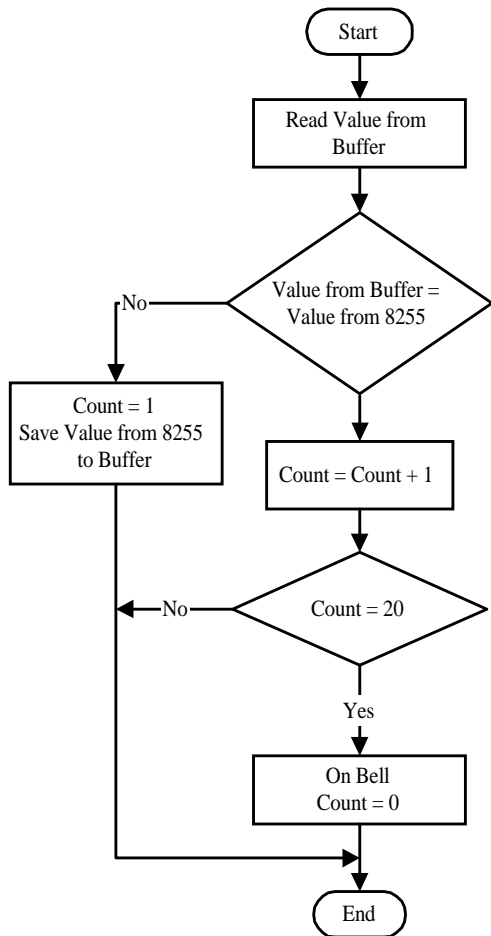


Figure 2 : Procedure of fire alarm detection

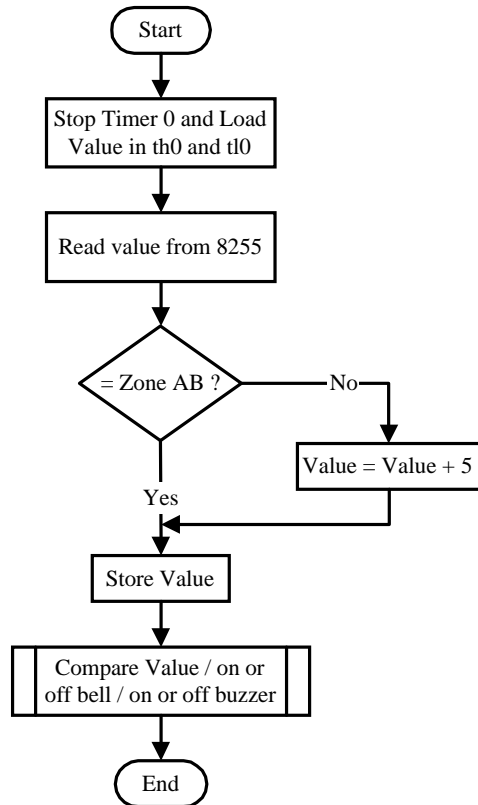


Figure 3 : Interruption of zero timer signal



Figure 4 : Output data of detector in each zone

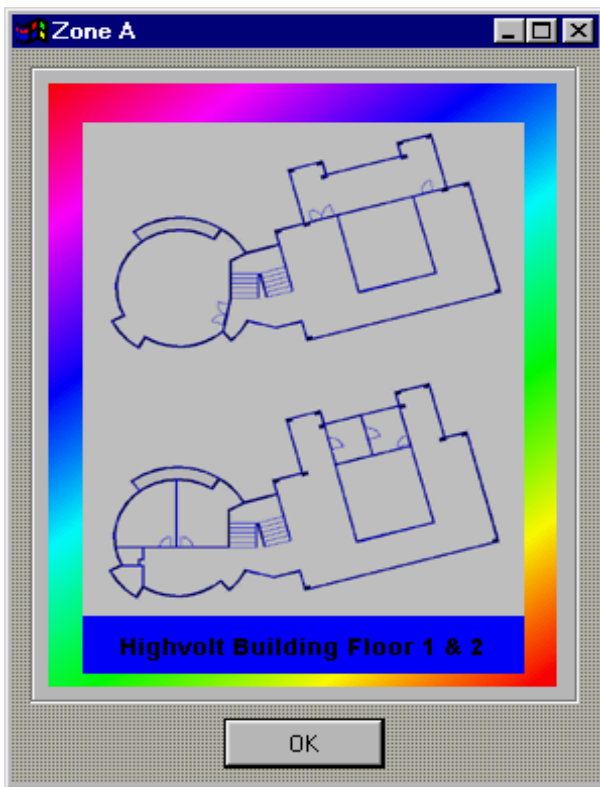


Figure 5 : Building configuration of the exemplification

3 RESULT AND DISCUSSION

To verify the system, the designed fire alarm system is installed at high voltage building having 2 stairs. Then, all conditions of working state are tested. Figure 4 demonstrates the status of fire alarm detector happening

in each zones. When fault status is taken place, controller will immediately detect zone that has flaw and display it on monitor. After that, output signal from microcontroller will be delayed in the period of time setting before is sent to bell. At the same time, user can select to view the building map that describes the position of all detectors and fault point. Figure 5 is an exemplification. From the figure, the bottom picture is the first floor and the top one is the second floor. When fault is taken place in the building, this frame will clearly manifest the zone order and the position of fault on monitor. This advantage for guardedness to extinguish fault before everything catches fire or before fire occurs.

From the test, those systems can completely alarm and check under 4 conditions. However, during the test, there is a problem of voltage source, which supplies for microcontroller. That is if the voltage level is lower than 4.7 V or higher than 5.2 V, IC Watchdog on ANT-31PJ V2.0 that is used to protect the hanging over of system will be reset all times. Hence, microcontroller will have no reliability of analysis. This problem can be solved by separate ground and isolated difference voltage level.

4 CONCLUSION

This paper has deal with the fire alarm system controlled by using computer based on realistic practical utilization. According to the test result, the designed and constructed fire alarm system is found to be useful. This is because the controller possesses not only more efficiency but also more accuracy. The fire alarm system, furthermore, is more convenient to control and to installation. Because all information such as the characteristic of working state, date and time in each part of day are recorded, hence, this is useful not only for revisory but also improving the further fire alarm system.

5 REFERENCES

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