

A SMS Alerted Anti-theft System based on 51 SCM

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Keywords: 51 SCM; Anti-theft lock; GSM SMS.

Abstract. A SMS alerted anti-theft system based on 51 SCM, which designed different trigger circuits aiming at forced unlock according to structural characteristics of different locks, and trigger microcontroller to control GSM SMS module to send reminded messages. It can reduce losses to maximum extent and have good feasibility and broad application prospects.

Background

A SMS alerted anti-theft system based on 51 SCM, which is aimed at detecting trigger signal from trigger circuits of forced unlock and controlling GSM SMS module to send reminded messages by microcontroller, so that reduce losses to maximum extent. Performance of locks develops rapidly, but the means of forced unlock also upgrade constantly. Therefore, it is important to design trigger circuits according to different structural characteristics and different principles of unlocking, and remind users according to microcontroller and GSM SMS module to reduce losses. The system owns strong principles, good feasibility and wide range of applications.

The overall design of the system

The alarm system consists of four parts, 51 microcontroller and trigger circuits of anti-theft system, power module and GSM SMS module. The design principle is as follows. Design of trigger circuits is according to different structural characteristics and different principles of unlocking. This article focuses on the level triggered interrupt generated by locks when it has been sheared. Power module is divided into two parts, and one part is used to provide 5V/2A power supply for the GSM module, the other is used to provide 5V power supply for the microcontroller; SMS module obtains commands and information from the microcontroller serial ports, and then sends information of picking the lock to users; Microcontroller receives the information from the trigger circuit, and reacts after the processing and judgment. Anti-theft system hardware block diagram is shown in Figure 1.

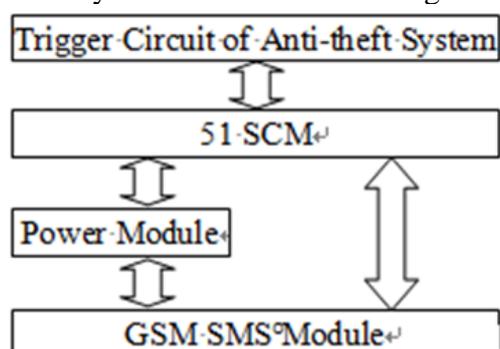


Figure 1 Alarm system hardware structure

Workflow of alarm system is as follows. After the lock is latched, GSM SMS module turns to initialized waiting, and it can begin to work if it is normal, if not, please restart module; Then detect whether the lock is forced open, if it is, microcontroller will do processing and judgment with signals, and control GSM SMS module to send reminded messages to users through commands and information from the serial port TXD after making sure that lock has been forced open, if not, continue to detect. The workflow is shown in Figure 2.

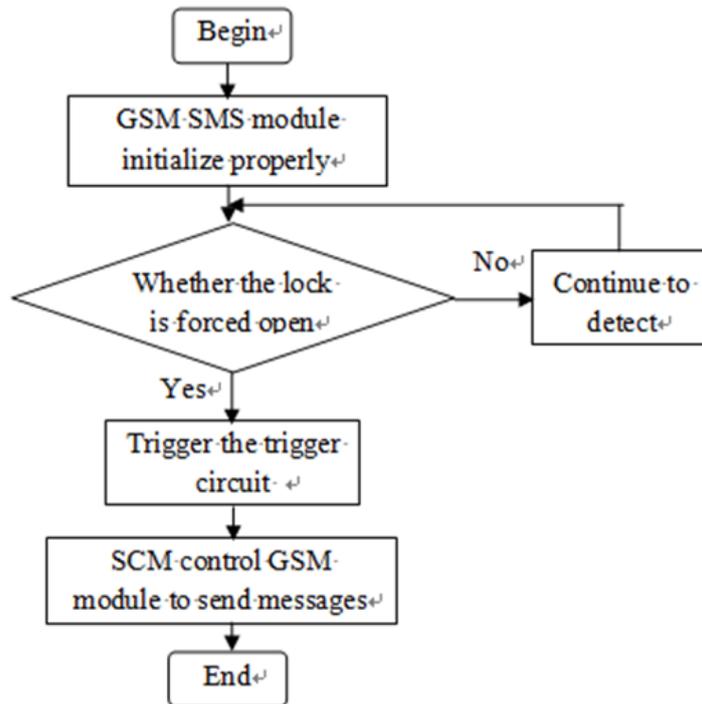


Figure 2 Anti-theft system work flow chart

Overall circuit design system

Overall system circuit diagram is shown in Figure 3.

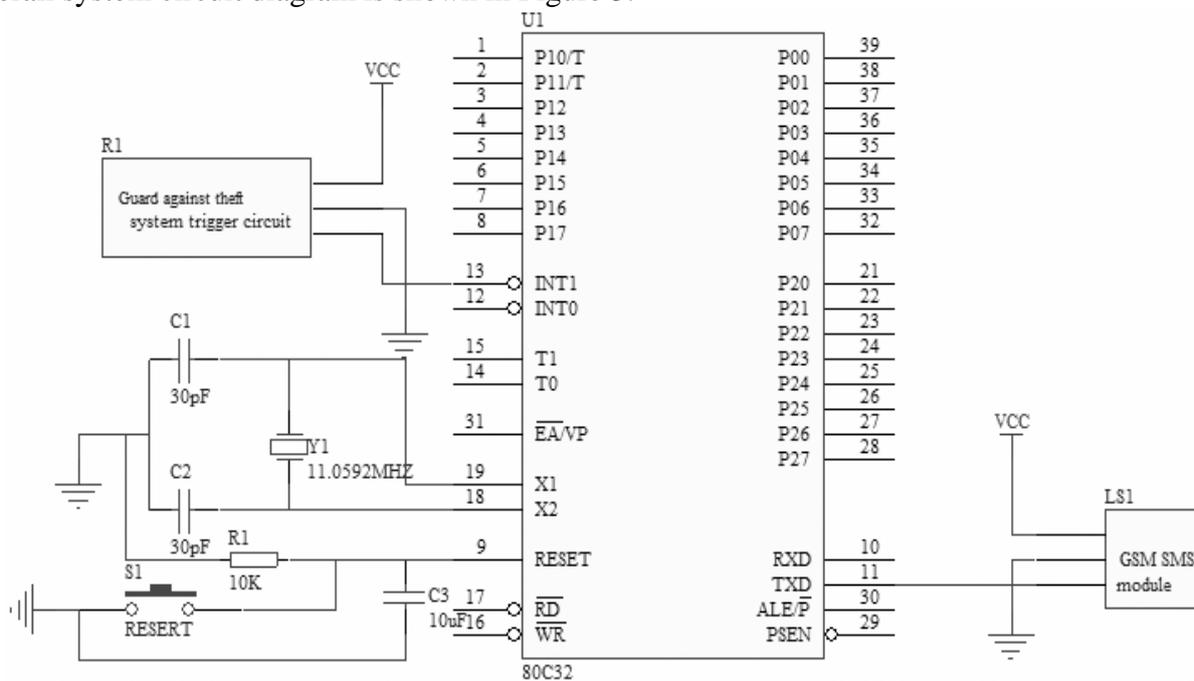


Figure 3 Overall system schematic

MCU clock circuit uses HC49/S-HC/49SS passive crystal, which connects interface XTAL1 and XTAL2 with other two 30pF ceramic capacitors and its nominal frequency is 11.0592MHz; Reset circuit using buttons and electrolytic capacitors series connection; GSM SMS interface module has VCC, GND, TXD, RST and RI ports and VCC, GND, RXD are used. SMS module's power requirements are high, and need 1-2A current to work normally. Anti-theft system trigger circuit triggers external interrupt interface of microcontroller according to level changes after triggered.

Design of trigger circuit

The principles of unlocking with keys is to use the specific shapes of keys to jack up the pin to shear line position exactly, up and down pin down exactly separate at this point, and the lock is open after twist.

There are two forms of forced unlock, the one is to wiggle out of a groove between the inner and outer cylinder with crowbar, then jack up pins one by one, be held by groove, and turn to open. The difference between unlocking with key and it is that the former jack up pins first and then turn, while the latter is opposite. The other is to cut off the lock body directly with pliers, and it accounts for more than 60% the proportion of theft. The system is mainly aiming at this type of unlocking form to design a trigger circuit. The principle is shown in Figure 1.4.

The trigger circuit consists of two resistors, whose resistances are 1K and 0.5K respectively, and connect the external interrupt port INT1 of microcontroller between them. Bold part is connected to the lock body, INT1 jump from high level to low level when this section was cut off by pliers forcibly, so that it elicits a response which is triggered by the microcontroller when in active low level.

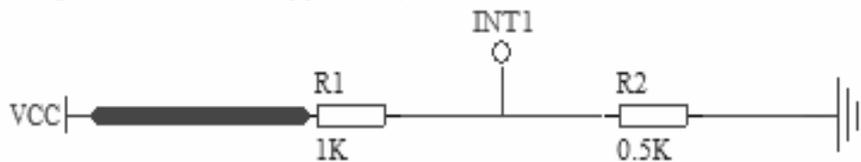


Figure 1.4 trigger circuit schematics

Software Design

System program consists of two parts, and the one is start detection of external interrupt, the other is Coded information of SMS message. It will elaborate program designing ideas from above two aspects.

The principle of the system is that trigger circuit generate level changes, thus trigger external interrupt interface and trigger microcontroller's action. Start of external interrupt needs to be done at initialization, commands of "EA = 1" turn on a total interruption, "EX1 = 1" turn on the external interrupt 1, and the system uses the external interrupt 1. "IT1 = 0" set external interrupt into in low level, "IT1 = 1" set external interrupt into triggered valid in the falling edge. If level change from the trigger circuit is different, its triggered settings of initialization will be different accordingly.

Several major commands of controlling GSM module to send SMS text messages by SCM are as follows. "AT", "AT+CMGF=0" and AT+CMGS=*, the most important of it is to determine representation digital of "*", and coding of SMS module which send Chinese characters controlled by SCM is the PDU code. The following describes the code of system sending distress content. Remove the "+" sign of center number of the message, and determine whether the length is an even number, if not, add F in the end, for example, "8613800546500F", then, do the same processing for the set of phone number. Part processing of SMS is to convert a string to Unicode code, for example, "In danger, please timely rescue, longitude: **, latitude: **", and the Unicode code is "9047523053719669FF0C8BF753CA65F662A26551FF0C7ECF5EA64E3AFF1A002A002AFF0C7EF45EA64E3AFF1A002A002A", and then divide the length of this code is by 2, retain two hexadecimal numbers, referred to as **n**, assemble the resulting number again with code, referred to as **msg**, and finally, assemble several converted code. Add the string "11000D91" before the phone number, add 0008A7 after the phone number, finally add **msg**, the whole string of code referred to as **all**, then **all** is done. At first, SCM send "AT" to the SMS module through a serial port TXD, return "OK", then send "AT + CMGS = n", finally send "**all**" code string, send 1A with hexadecimal, and SMS is end.

Prospects and Conclusions

A SMS alerted anti-theft system based on 51 SCM, which designed different trigger circuits aiming at forced unlock according to structural characteristics of different locks. It has original design concept

and provides a set of complete control system, where trigger microcontroller to control GSM SMS module to send reminded messages by trigger circuit. It can reduce losses to maximum extent and have good feasibility and broad application prospects.

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