# Based on PIC16F628A single chip electronic lock design

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Today, we are living in the in the of embedded systems surrounded by devices that based on the embedded systems like cars, washing , medical equipment’s etc.An embedded system is a computer system designed for specific control functions often with realtime computing constraints.It is embedded as part of a complete device which often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer(PC), is designed to be flexible to meet a wide range of end-user needs. Embedded systems control many devices in common use today. One of prominent example of an embedded system is a microcontroller , which is a small and tiny computer designated to perform some specific tasks. A microcontroller program(firmware) is the one, which decides what functionality the microcontroller provides to a user. A program that has the ability to run on a microcontroller without the need of an operating system is called as a firmware. That means, a firmware has the privilege to access the hardware directly.This paper tries to explain an electronic lock firmware in detail. The basic idea of microcontroller is to collect all the input and output peripherals in one simple circuit, which represent the microcontroller instead of the large and sophisticated computer with microprocessor and large numbers of peripherals.

The firmware directly deals with peripherals and Input/Output ports to give complete

functionality of microcontroller.

Microprocessor differs from a microcontroller in many aspects. First and the most important aspect is its architecture. In order for a microprocessor to function properly, other components such as memory, peripherals and input output ports must be connected to it. In short, we can say that a microprocessor is the heart of the computer and it works a group with other peripherals/parts of the computer system.On the other hand, a microcontroller is designed to be comprised as a single unit which can perform independently. No other external component is needed for its application because all necessary peripherals and ports are already built into it. Ultimately, it saves the time and space needed to construct devices.

With the development of electronic technology, all kinds of electronic products emerge as the times require, electronic lock is one of them. According to the information, electronic lock research from the nineteen thirties began, in some special places early application. The lock is on the after the keyboard to input a password to complete the unlocking process. Study of the lock 's original intention, is to improve the safety of the lock. Due to the electronic lock key size ( code quantity greatly, with machine )Mechanical lock, and can avoid the key being imitated and stay safe hidden trouble. Electronic lock just remember one password, without carrying metal key, remove people carrying metal.The key of troubles, and by more and more people enjoy. Electronic lock variety, such as fingerprint lock, digital lock, magnetic lock, IC card lock, and other biological. But more practical or key type electronic lock. 2.Nineteen eighties, with the electronic lock special integrated circuits, electronic lock has the advantages of small size, high reliability, high cost, is suitable for use in high security.Occasions, and have power to provide energy, use is limited in a certain range, so it is difficult to popularize, no study has been significant progress.At present, in the western developed countries, electronic lock technology is relatively advanced, full range, electronic lock has been widely used in the intelligent entrance guard system, through a variety of more safety. A more reliable technology to achieve the management of door. In the our country electronic lock overall level still is in on international 70 time around, electronic lock the cost is very high, the market still with buttons.Lock, key type and the card key type electronic lock has been the

introduction of the international advanced level, now there are several factory production supply market. But the domestic self-developed electronic lock, the city field structure has not been formed, is applied. The domestic many enterprises also introduced the world's advanced technology, development foreground is very considerable.

The system is implemented using assembly language. The purpose of using this language is to get a better picture and understanding of the PIC architecture.Another positive aspect of using assembly language is that it gives very wide and flexible way to interact with microcontrollers even though its implementation is harder than BASIC or C languages, which are used as a language for programming microcontrollers. There are mainly two parts of the system implementations:

A. Keypad Implementation

The system dedicates PORTB for keypad implementation in which 4 pins are reserved for columns and the remaining 4 pins for rows. Hence, the system uses these 8 pins for construction of 16 keys matrix, which makes an efficient use of the limited ports provided in PIC16F628A.

There is an important precaution which must be taken while implementing the keypad because, the keypad processing rely on a mechanical process (pressing and releasing keys). This phenomenon generates a spark, which influences the electrical properties of pin while pressing and releasing the

key, which causes the pin status to be unstable and can’t be recognized properly whether it is 0 or 1. So, to overcome this, a delay must be provided to give enough time for the pin status to be stable and can be read correctly, this time could be 20ms or more.

1. Key Scanning

The keypad design is influenced by electrical phenomena, which states that, if we short circuit two pins, one with zero and the other with high voltage,then both the pin voltage would drop to zero.

This fact could be used for designing the keypad. As mentioned above, PORTB is reserved for the keypad and the most significant 4 bits are used for column indexing, which are set as input port (for input port, we must set TRISB register to high ) to check whether they have dropped to 0 voltage when they are attached with the selected row after pressing the key.

On the other hand, the least significant 4 bits of PORTB are set to output, and are used for row indexing. Since they are the output ports, they can be set to high (1) or low (0) by the firmware. By setting each row to zero for every key scan, the system can check each column, to see if any one of them is set to 0. If so, this means that one key of that row has been pressed. This process is repeated for all rows to check all the keys. The functions responsible for scanning key are row\_scan and col\_scan. 1.1 Row scan This function sets every row to zero at a time and calls col\_scan function to check if any column pins drop to zero voltage. This function then increments the key variable for each row assignments, to index the row.

1.2 Col\_scan

This function scans every column pin to check if any one of them is set to zero.

B. LCD Implementation

The other main part of the system implementation is LCD implementation. The LCD

configures to operate in 4 bits interface mode, because of PIC16F628A ports limitations.Sending the command 0x20 then 0x28 will configure the LCD to work in 4 bits interface mode , which means that the maximum characters can be displayed are 40 characters for a 20x2 LCD used by the system.

Electronic lock technology development so far, has been widely used in higher property security areas as information technology and computer technology and the constant development, electronic lock technology will have greater development. Both at home and abroad, the application of electronic combination lock are common, has the very good development prospect. Electronic combination lock commonly used in daily life and work, it is mainly used for guard against theft.

For example,our most common automatic deposit machine, the above is the keyboard type combination lock, if security is not good, bank will not use nature, visible keyboard type combination lock can be trusted. Now, with the progress of science and technology with the development of the electronic combination lock also reached a relatively high level, both on the function, safety performance, and stability is one of the more comprehensive. Now also appeared on the market for fingerprint recognition, is also useful to the human eye and human voice recognition and other high-tech electronic combination lock products. And in order to better achieve confidentiality, people begin to try to use a combination of ways, the password ways are used together, if use fingerprint plus key presses, and voice recognition, etc., so that you can have more privacy. It can be used for bank vault, because for such a performance requirements to the critical point of safety, the use of this combination lock that has a variety of key combination is appropriate, of course we can be bold to try. Even if the combination lock to use some inconvenient, it meet the requirements of the specific bank vault, that is to have extremely high confidentiality, it is special combination lock set for special occasions. So, use your imagination, we can develop more and better electronic combination lock, to meet the needs of public and specific people, to the point of the design of the electronic combination lock reached perfection.So, is extremely broad prospects for the development of the electronic combination lock, and trend of development is the trend of The Times.