

Special Multi-Purpose Card Designed using PIC16F877A and RFID Technology

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Abstract: - The Purpose of this project is to ease the verification functions. The RFID card will be given to the user which contains the digital code, which has to the corresponding details stored in the centralized database system which can be accessed in the relevant office as and when required. We want to utilize the electronic technology to build an integrated and fully customized security system at a reasonable cost.

Keywords: - Pic16f877a Microcontroller, LCD, Keypad, Rf-id Card, Buzzer.

I. INTRODUCTION

The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx and PIC16C7x devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self-programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port[1].

PIC16F877A has RISC architecture. This term is often found in computer literature, and it needs to be explained here in more detail. Harvard architecture is a newer concept than von-Neumann. It rose out of the need to speed up the work of a microcontroller. In Harvard architecture, data bus and address bus are separate. Thus a greater flow of data is possible through the central processing unit, and of course, a greater speed of work. Separating a program from data memory makes it further possible for instructions not to have to be 8-bit words. PIC16F877A uses 14 bits for instructions which allows for all instructions to be one word instructions. It is also typical for Harvard architecture to have fewer instructions than von-Neumann's[2], and to have instructions usually executed in one cycle.

Microcontrollers with Harvard architecture are also called "RISC microcontrollers"[3]. RISC stands for Reduced Instruction Set Computer. Microcontrollers with von-Neumann's architecture are called 'CISC microcontrollers[4]. CISC stands for Complex Instruction Set Computer.

Since PIC16F877A is a RISC microcontroller, that means that it has a reduced set of instructions, more precisely 35 instructions. (Ex. Intel's and Motorola's microcontrollers have over hundred instructions) All of these instructions are executed in one cycle except for jump and branch instructions. According to what its maker says, PIC16F877A usually reaches results of 2:1 in code compression and 4:1 in speed in relation to other 8-bit microcontrollers in its class. PIC16F877A perfectly fits many uses, from automotive industries and controlling home appliances to industrial instruments, remote sensors, electrical door locks and safety devices. It is also ideal for smart cards as well as for battery supplied devices because of its low consumption [5].

EEPROM memory makes it easier to apply microcontrollers to devices where permanent storage of various parameters is needed (codes for transmitters, motor speed, receiver frequencies, etc.). Low cost, low consumption, easy handling and flexibility make PIC16F877A applicable even in areas where microcontrollers had not previously been considered (example: timer functions, interface replacement in larger systems, coprocessor applications, etc.).

II. OUR WORK

This system demonstrates a circuit named Special Multi-Purpose Card Designed Using PIC16F877A and RFID Technology. This system consists of Pic16f877a Microcontroller, LCD, Keypad, Rf-id Card, and Buzzer. A RFID passport is an electronic identity that used to authenticate the citizenship of travellers. For example - E-Passport, if the user goes to the embassy to apply for a Visa or for immigration purposes, the user has to show the card before the card reader which will be connected to PC, once he / she shows the card it will ask for a PIN number and once the PIN number entered correctly it will display the user details, Name of the Passport Holder, His / her father / Mother / Spouse Name, Nationality, Mother Tongue, Gender, Date of Birth, Age as on issue Date, Place of Birth, Current Residential Address, Phone Nos, Place of Issue, Date of Issue along with the other details like the

Place(s) which he / she has already visited, Date, time and duration of the Visit(s), Purpose of the Visit, Place where he / she stayed, Insurance details, etc., The above data(s) can be accessed and retrieved as and when required and updated while the user travels. Similarly for VOTERS ID, it will contain the following details in the database and which can be retrieved and verified within few seconds using the RFID card, ID No, Elector's Name, Father's Name / Husband's Name, Gender, Date of Birth, Age as on issue Date, Residential Address, Place of Issue, Date of Issue. The above data(s) can be accessed and retrieved as and when required to establish the identity of the person.

The same will be also applicable for DRIVING LICENSE[6], the following details from the database and which can be retrieved and verified within few seconds using the RFID card, Driving License No, Name, Father's Name / Husband's Name, Date of Birth, Residential Address, Place of Issue, Date of Issue, Valid up to details. The above data(s) can be accessed and retrieved as and when required to establish the identity of the person.

III. BLOCK DIAGRAM

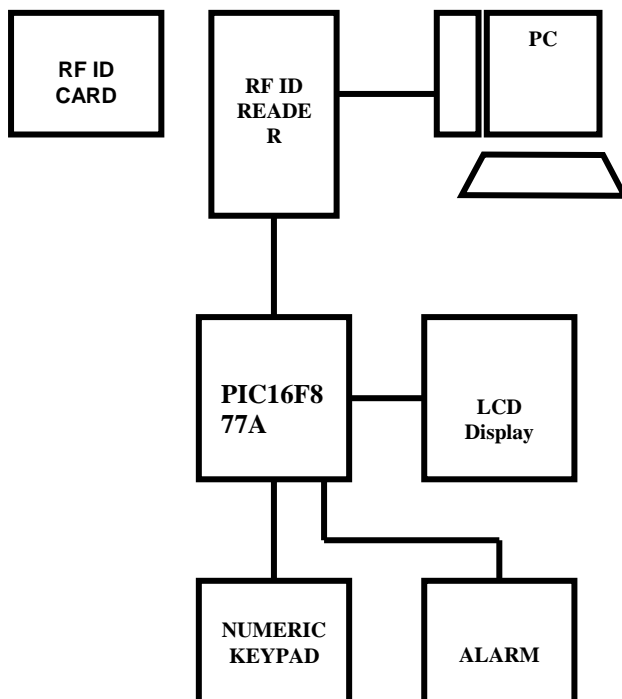


Fig.1 shows the block diagram.

The major components of this project are PIC Microcontrollers, RFID Tag Reader and RS 232 protocol cable to communicate with PC

A) Power supply

The Entire Project needs power for its operation. However, from the study of this project it comes to know that we supposed to design 5v and 12v dc power supply. So by utilizing the following power supply components, required power has been gained.

(230/12v (1A and 500mA) – Step down transformers, Bridge rectifier to converter ac to dc, booster capacitor and +5v (7805) and +12v (7812) regulator to maintain constant 5v & 12 supply for the controller circuit and RFID Reader).

B) Microcontroller PIC16F877A

The major heart of this project is PIC16F877A microcontroller, the reasons why we selected this in our project?, it has more features like 16bit timer, 10-bit ADC, USART, SPI, I2C, 256 bytes of EEPROM memory, and 8kbytes of flash program memory, then at last its speed of program execution is about to 1 microsecond or 10 MIPS (10 Million Instructions per second)[7], etc. However, compare to other microcontroller it is fast and very ease to program in C language because of huge support can gain from the manufacturer (Microchip Corporation)for programming. The special IDE offered by the manufacture, it is named as MPLAB IDE for it code generation purpose. Then one more thing is several cheapest programming tools to dump the coding in to the controller are available, for example: ProPIC, PIC Flash, ProMATE, and ProUniversal.

C) RS232 (USART)

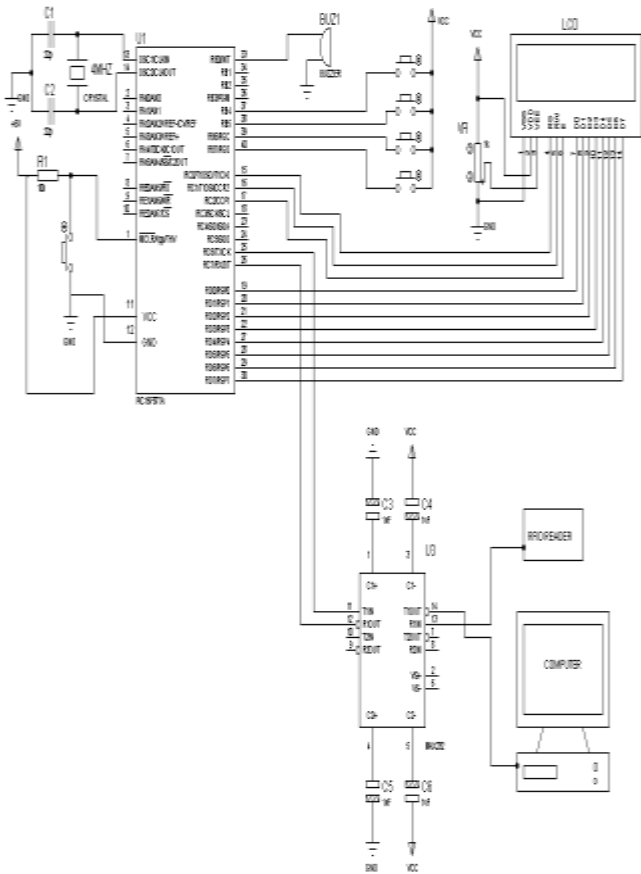
The PIC microcontroller is connected to PC through RS232 protocol, for this inbuilt USART module is utilized. A serial port sends and receives data one bit at a time over one wire. While it takes eight times as long as to transfer each byte of data this way, only a few wires are required[8]. In fact, two-way (full duplex) communications is possible with only three separate wires- one to send, one to receive, and a common signal ground wire.

D) RFID Reader Details

The DLP-RFID1 is a low-cost, USB-powered module for reading from and writing to ISO 15693, ISO 18000-3, and Tag-it™ intelligent RFID transponder tags. It has the ability to both read and write up to 256 bytes of data in addition to reading the unique identifier (UID/SID). All of the DLP-RFID1's electronics and antenna reside within the compact unit, and all operational power is taken from the host PC via the USB interface. The range of the internal antenna is up to 4 inches depending upon the size of the tag being read. RFID stands for Radio Frequency Identification. It is an electronic technology whereby digital data encoded in an RFID Tag (or transponder) is retrieved utilizing a reader. In contrast to bar code technology, RFID systems do not require line-of-sight access to the tag in order to retrieve the tag's data, and they are well suited to harsh environments[9].

The LCD and Keypad are the other peripheral used for user interface here we are using 16x2 LCD display. The PC it consists of different software for multipurpose RFID card demo, one is for e-passport,

second one is for voter ID[10], third one is for Driving license.



IV. CIRCUIT DIAGRAM

Fig.2 shows Circuit diagram.

Circuit Description

When the user shows their RFID tag the controller part it will ask for password, through keypad and LCD user could enter that. If the password and user ID were matched system will display the user information from database on the PC.

Here we are using PIC16F877A MCU which is interfaced with PC and RFID reader. The keys are connected in PORTB (RB7, RB6, RB5, RB4), the LCD it is Connected in PORTC (RC0, RC1, RC3) these are LCD control pins and PORTD (RD7 to RD0) these are LCD data pins.

If the RFID connected MCU reads RFID tag information it will send those information to PIC MCU, then MCU forward those information to PC (through RS232 communication cable, refer block diagram description), there the information will be compared with database and user information will be displayed on the system screen depends on the place where it is used. If the RFID tag and password are mismatched system will produce alarm which is connected in one of the MCUs RB0th pin.

APPLICATIONS & MERITS:

The entire project idea is to develop a multipurpose RFID card; a single card will be used as follows

- E-Passport – when applying for visa.
- Voter Id – period of election.
- Driving License – when using a car or bike/motor cycle.
- Family Card

ADVANTAGES:

- Easy to install, light weight
- Low cost and low power consumption by the equipment
- Fast response to identify the users information from the database
- It will reduce the people confusion when and where to take which kind of ID proof

V. CONCLUSION

In order to implement contemporary system of “Multipurpose RFID system” the embedded systems platform has utilized. For this purpose, a new RFID technology based on micro-controller was implemented and tested in this study. The verification system presented has the following advantages: The verification system consists of data base about the user of RFID multipurpose card; through that we can verify the details about name of the user and age passport number, driving license information, family information can be stored on database of PC using Java based front end software. The state of art of microcontroller PIC16F877A used as a mediator in between PC and RFID; it act as user interface whenever user shows RFID card it will read out by PIC MCU using RFID card reader then it transfer those thing to PC interfacing/ front end software. The RFID security system is major role of this project; the system will give including user Image/Photo information so that it is possible to check in the place of passport verification system, etc.

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