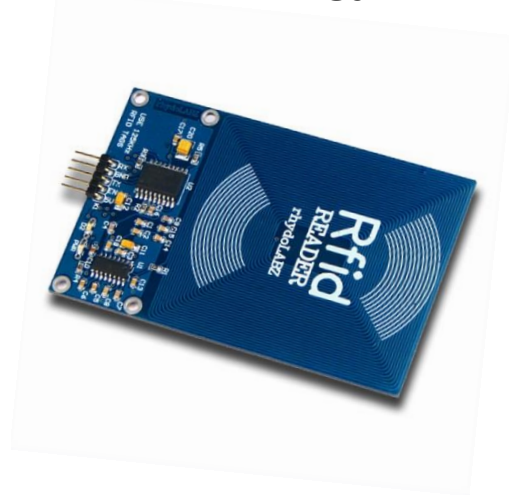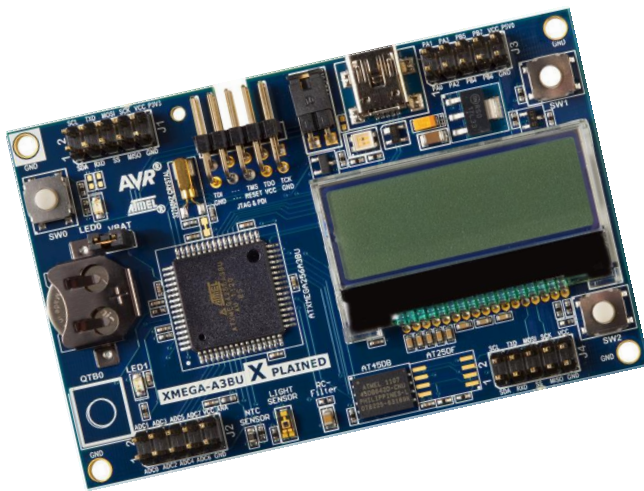# Final Project report for Atmel Embedded Design Contest- 2014

RFID Based Security System

Sardar Vallabhbhai National Institute of Technology, Surat

Name	College ID/Roll No.	UG/PG	Course/Branch	Semester
RIKEN MEHTA	U12ee004	UG	Electrical	5th
MILANKUMAR PATEL	U12co083	UG	Computer	5th
RAJAT KHANDELWAL	U12ec094	UG	Electronics	3rd

Mentored by:

Dr. M. A. Zaveri
Associate Professor
Computer Engineering Department
S. V. National Institute of Technology
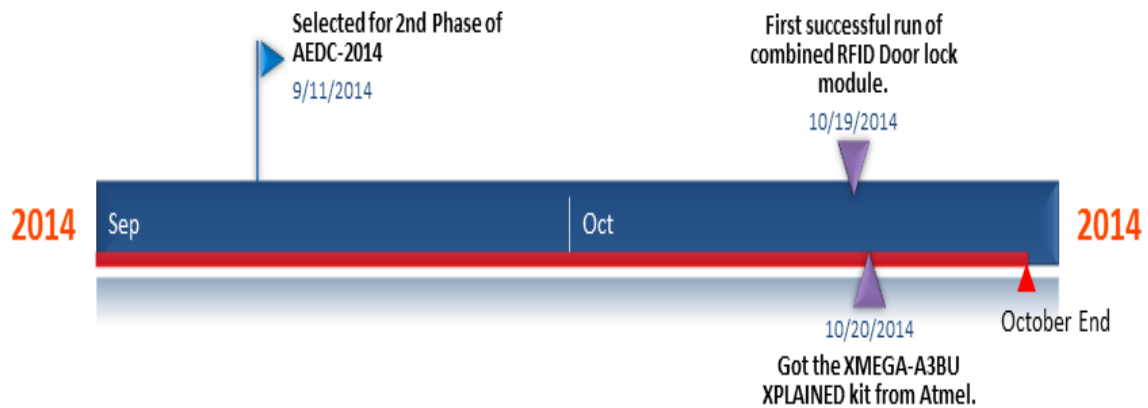Gaurav Path, Ichchhanath,
Surat, Gujarat 395007

Final Project Report

- As per the project proposal submitted in Phase- I, we have to design a totally robust RFID based security system. Taken into consideration the required pre-requisites for the project, we had started searching about the different RFID reader available and different systems that can be used for the project. We had found a RFID reader and required tag which communicates with MCU through UART serial communication protocol.

- As per the project report submitted on 30_{th} October, we have successfully implemented RFID card detection on ATmega32. We tested our module with simple locking mechanism. And then we started learning different modules of XMEGA-A3BU kit.

- We successfully implemented the hands-on tutorial provided by Atmel. We have learned how to program the board, How to use AVR-Dragon hardware debugger, how to use Atmel Software Framework and its libraries.

- Going to step-2, we learned everything about that module from its datasheet. We studied about the UART protocol required for interfacing of RFID reader with MCU.

- Meanwhile we started building the door lock mechanism required for the testing of the whole system.
- We didn't have the XMEGA-A3BU kit, so we started experimenting RFID module with ATmega32. We interfaced it with ATmega32.

- We also required Real Time Clock for database of the accessed cards for our project. We started looking for the IC available for RTC. We found DS1307 RTC available. We studied about it, how to interface it with ATmega32.

- We successfully tested all the modules with primary door lock mechanism made for experiments. Here is the video link of the testing. http://youtu.be/0Z_zeYu15lo

- After we get XMEGA-A3BU starter kit, we started studying its datasheet and user manual. We completed startup tutorials provided by Atmel.

- After getting command over XMEGA-A3BU kit and its programming methods, we started focusing on our first requirement, i.e. Real Time Clock feature.

- Before we thought of interfacing external RTC in our project. But later on we found that the kit itself is contained with inbuilt RTC.

- We went through default examples of RTC, than do some modifications according to our need. Finally we got our RTC module working in about 1 week.

- Next step was to interface RFID reader with XMEGA kit. As RFID reader works with UART serial protocol, we need to successfully implement UART on the kit.

- Firstly we faced the difficulty in configuring UART on XMEGA, as register description and function associated are different from ATmega32. But later on after some debugging we succeed in implementing UART on the kit.

- Next we were facing problems in displaying the output of the card detection algorithm. So we thought of using graphical LCD of the kit for it.

- We have seen the example codes available on Atmel Studio. We used ASF library for display functions. We also written some specific function according to our need. At last we had our display unit as our output.

- After that, we needed to implement card detection algorithm for RFID reader. After some trial and correction, we got our first breakthrough in Card detection. We successfully detected the card and were able to distinguish a particular card from many. These can be seen in the demo video submitted along with the report.

- In spite of having work on software side, we also started working on circuit side. We implemented relay circuit for power backup. We used relay to switch between adaptor supply and battery backup supply in case of power failure. This feature is also shown in the video submitted along with the report.

- After completing all the requirements in our project, we started finishing and optimizing our code for the system. Finally we have our final and fully featured door lock security system based on RFID technology.

- We have submitted the videos and final working code along with the project report.

Timeline Chart

Selected for 2nd Phase of
AEDC-2014
9/11/2014

First successful run of
combined RFID Door lock
module.
10/19/2014

2014 Sep | Oct | **2014**

10/20/2014
Got the XMEGA-A3BU
XPLAINED kit from Atmel.

October End

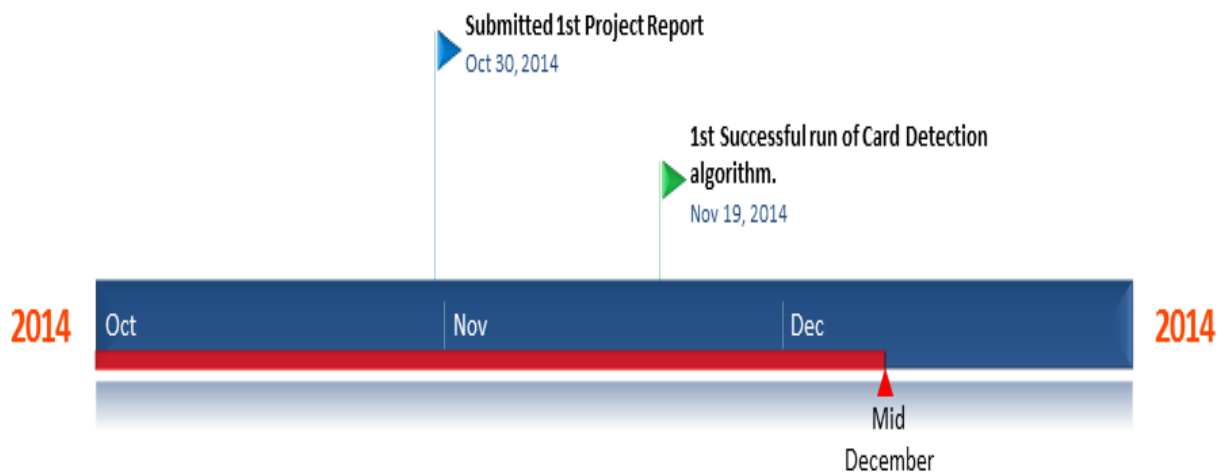| Task	Start	Bar	End
Read about RFID reader & tag.	Sep 12, 2014		Sep 14, 2014
Studied about UART serial communication.	Sep 15, 2014		Sep 20, 2014
Made the mechanism for the door lock system.	Sep 17, 2014		Sep 30, 2014
RFID reader interfacing with AVR atmega32 MCU.	Sep 20, 2014		Sep 25, 2014
Studied about Real time clock (RTC).	Sep 26, 2014		Oct 2, 2014
Interfacing of RTC (DS1307) with ATmega32.	Oct 3, 2014		Oct 10, 2014
Test proximity sensor with ATmega32.	Oct 19, 2014		Oct 19, 2014
Collected data sheets and tutorials for XMEGA-A3BU.	Oct 21, 2014		Oct 22, 2014
Completed Handson given in the tutorial on XMEGA-A3BU.	Oct 23, 2014		Oct 30, 2014

Submitted 1st Project Report
Oct 30, 2014

1st Successful run of Card Detection algorithm.
Nov 19, 2014

| 2014 | Oct | Nov | Dec | 2014 |

Mid December

Task	Start	End
Get command over kit programming and debugger.	Oct 30, 2014	Nov 4, 2014
Started working on power backup circuit design.	Nov 3, 2014	Nov 6, 2014
Implemented RTC on XMEGA-A3BU.	Nov 5, 2014	Nov 9, 2014
Power backup circuit implementation and testing.	Nov 7, 2014	Nov 11, 2014
Configured Graphical LCD Display.	Nov 10, 2014	Nov 14, 2014
Studied about logic level shifter (5V to 3.3V)	Nov 13, 2014	Nov 14, 2014
Implemented UART on XMEGA-A3BU	Nov 15, 2014	Nov 18, 2014
Implemented Card detection algorithm.	Nov 18, 2014	Nov 22, 2014
College submissions and exam. (No work on Project)	Nov 25, 2014	Dec 6, 2014
Report preparation and demo video.	Dec 7, 2014	Dec 10, 2014

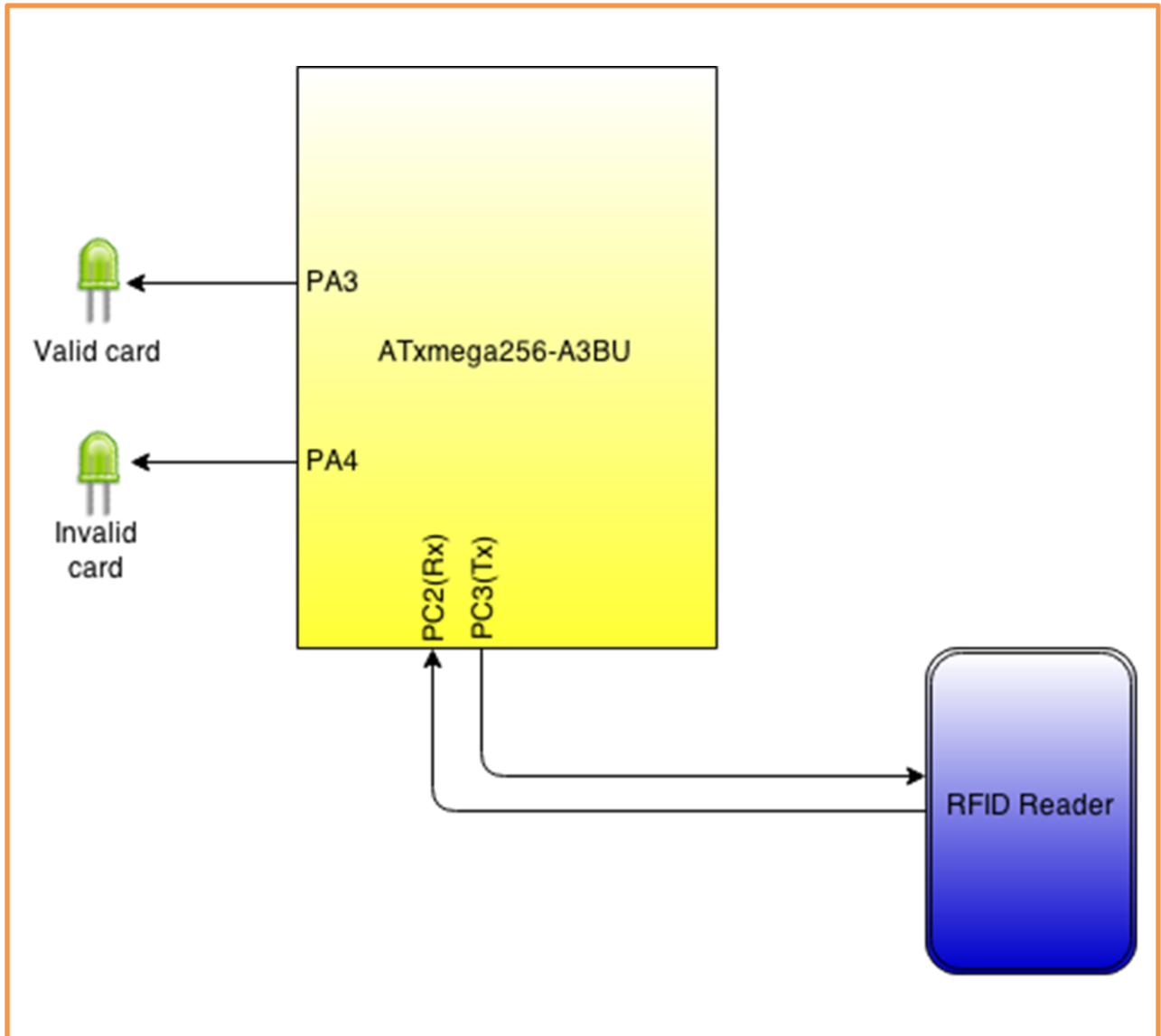# Circuit Implemented in video:

Figure 1: Reader and Indication circuit
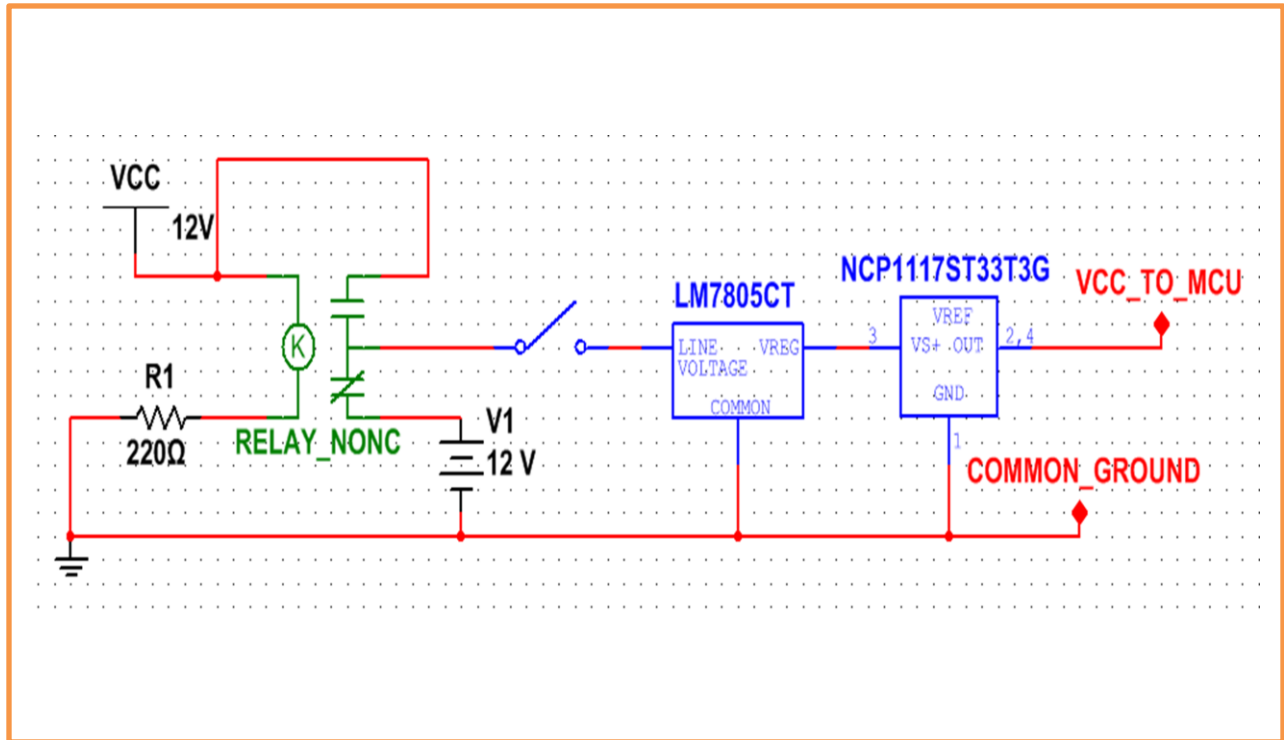
Power Backup circuit:

Figure 2: Power backup circuit
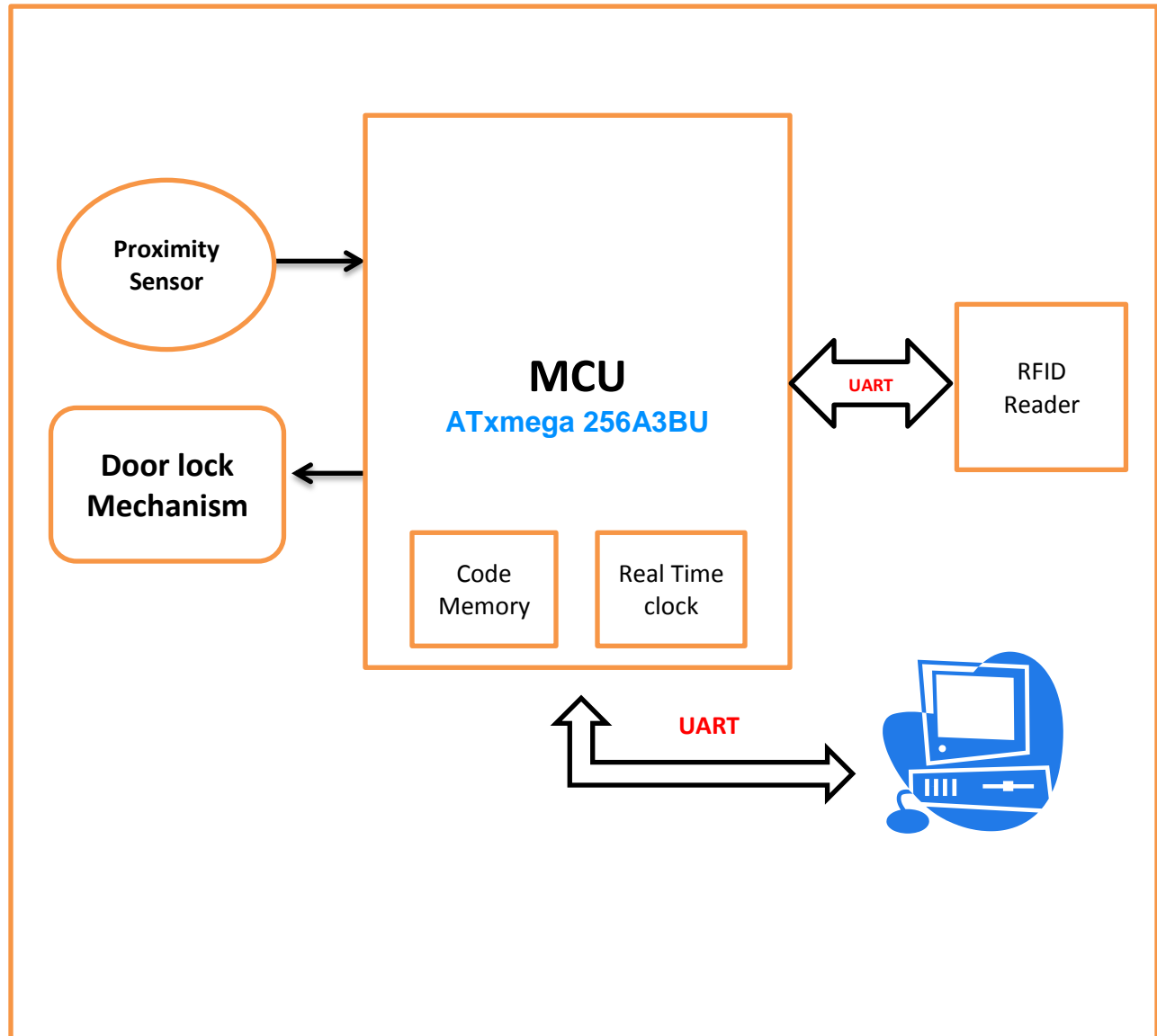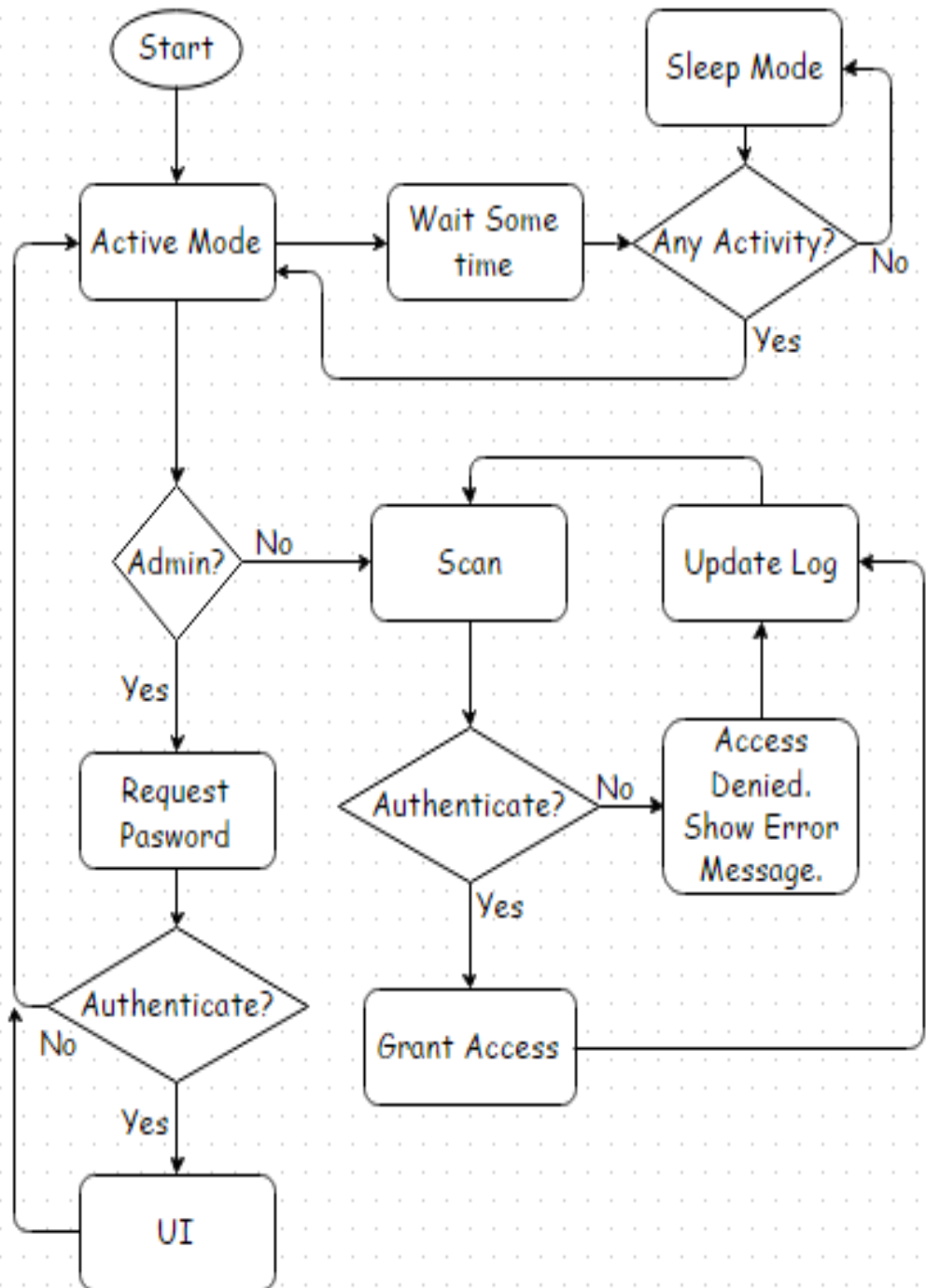
Overall circuit diagram:

Figure 3: Controller Circuit

Flow chart of the software:

Conclusion

Finally our card detection is working on XMEGA-A3BU kit. We are now ready with final fully featured product of Door lock security system based on RFID technology. We have implemented the system in our own Laboratory and now we are looking forward to implement it in department Laboratory.