❑ **UNDER THE GUIDELINES OF**

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CAR BLACK BOX

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❑ Topics Learning During This Project

- Embedded C Programming

- Introduction To Microcontroller
- Microcontroller Vs Microprocessor

- Embedded Systems
- Types Of Embedded Systems

- Microcontroller PIC18F4580

- Types Of Memory (EEPROM, PROM, Mask, ROM, SRAM, DRAM, Flash Memory)

- Interrupts & All required Peripherals

- Components like (LED's, Digital Keypad, Matrix Keypad, Timers, Potentiometer, CLCD, RTC, I2C Protocols, UART etc…)

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❑ ABSTRACT:

The "Car Black Box" project aims to develop an integrated system that acts as a data recorder and monitoring device for vehicles. This system, commonly known as a black box, will capture and store critical information related to the vehicle's operation, providing valuable insights for accident analysis, driver behavior assessment, and overall vehicle performance evaluation.

Introduction

What is Car Black Box?

- A Car black box is a device which is installed in your vehicle in your car which will monitor your driving, like it will record event like accident, if accident will happen it will record, speed it will record, mileage it will record.
- Few car black box records location too.
- It is also called as event data recorder.
- The black box is an extremely durable electronic device capable of recording valuable information in the moments.

❑ Need Of Car Block Box

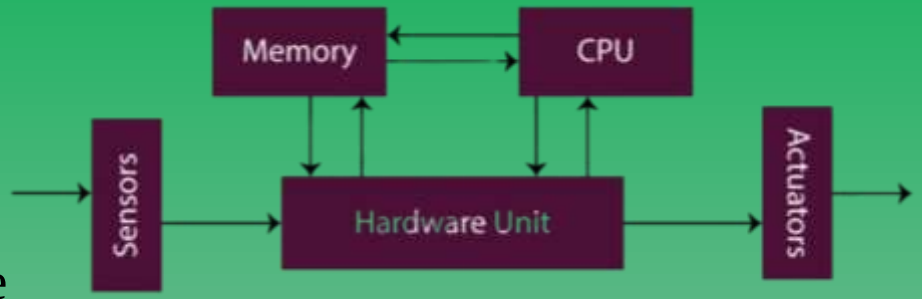
- Car Black Box mostly focuses on enhancing safety standards of driven vehicle by monitoring vehicle performance and diving behaviour.

- Whatever records recorded by this box can be viewed by law enforcement agencies in case of any issue.

- If there any issue, your insurance company can also check this box and if you done the insurance you will get the money.

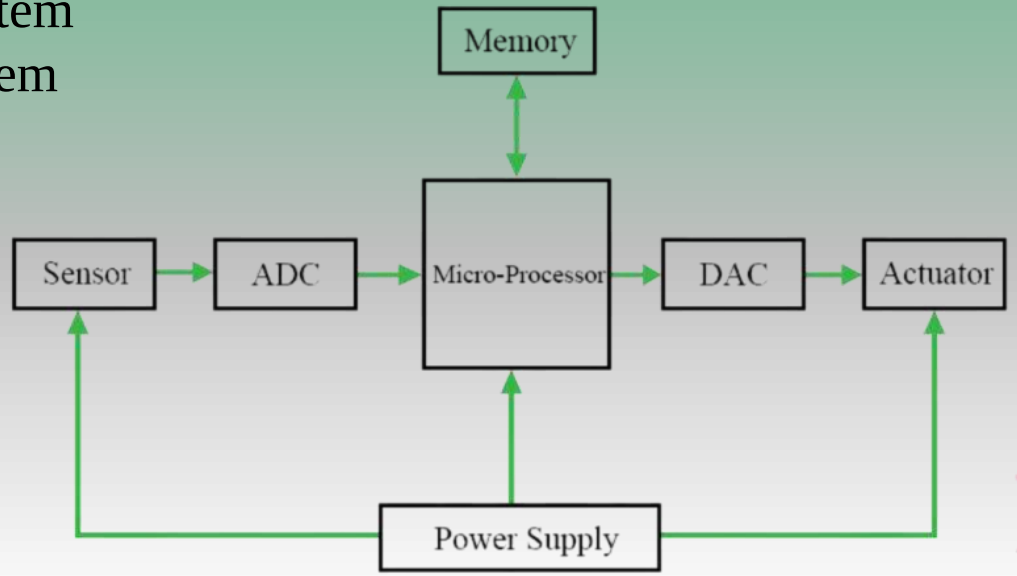
❑ Embedded Systems

- Embedded system is combination of any hardware and software which is intended to do specific task.



- A General Purpose System(GPS) is used to perform large numbers of tasks whereas an Embedded System(ES) is used to perform specific task.

- Types of Embedded systems:
  1. Standalone System
  2. Real Time System
  3. Networked
  4. Mobile



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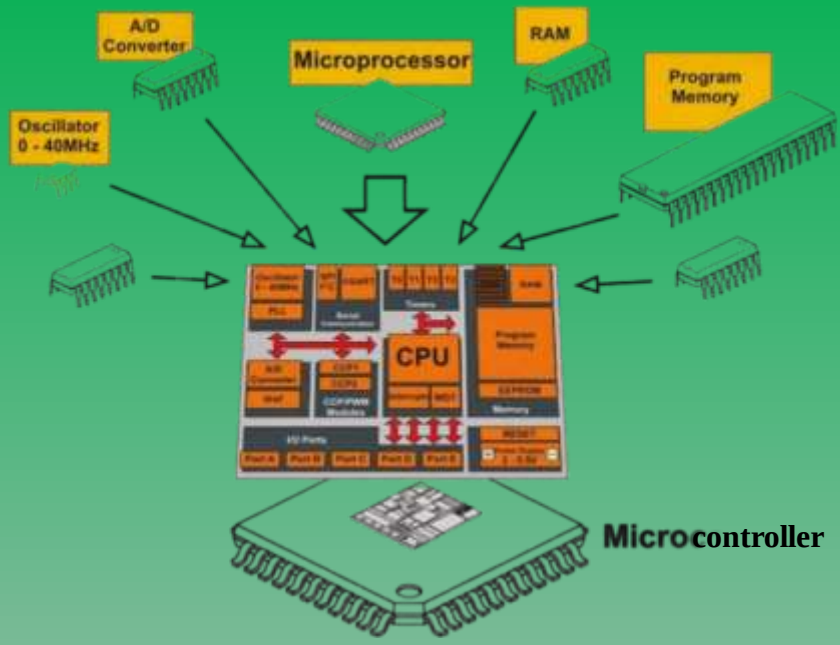
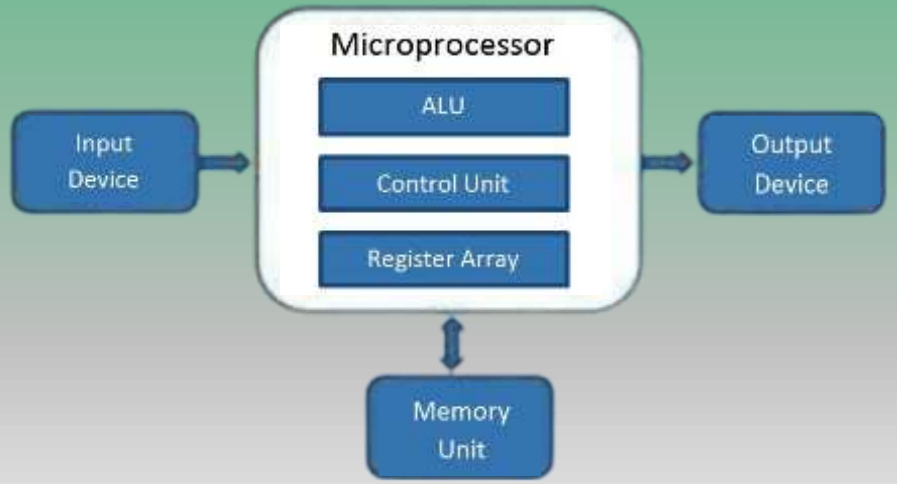
❑ Microcontroller & Microprocessor

- An integrated circuit which is capable of being programmed to perform a specified task
- It has design restrictions such as memory size, I/O capabilities, peripheral functions etc..
- Choose a microcontroller based on applications, performance, price, availability of tools and special capabilities.

❑ Microcontroller Vs Microprocessor

- The difference between microcontroller and microprocessor is, in microcontroller all components will be in single chip, less flexible & less design complexity.





- While in microprocessor all components are assembled separately, more flexible and more design complexity

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❑ How To Choose Embedded System?

- Low power consumption
- Cost Efficiency
- Efficient use of processing power
- Reliability
- Efficient use of memory

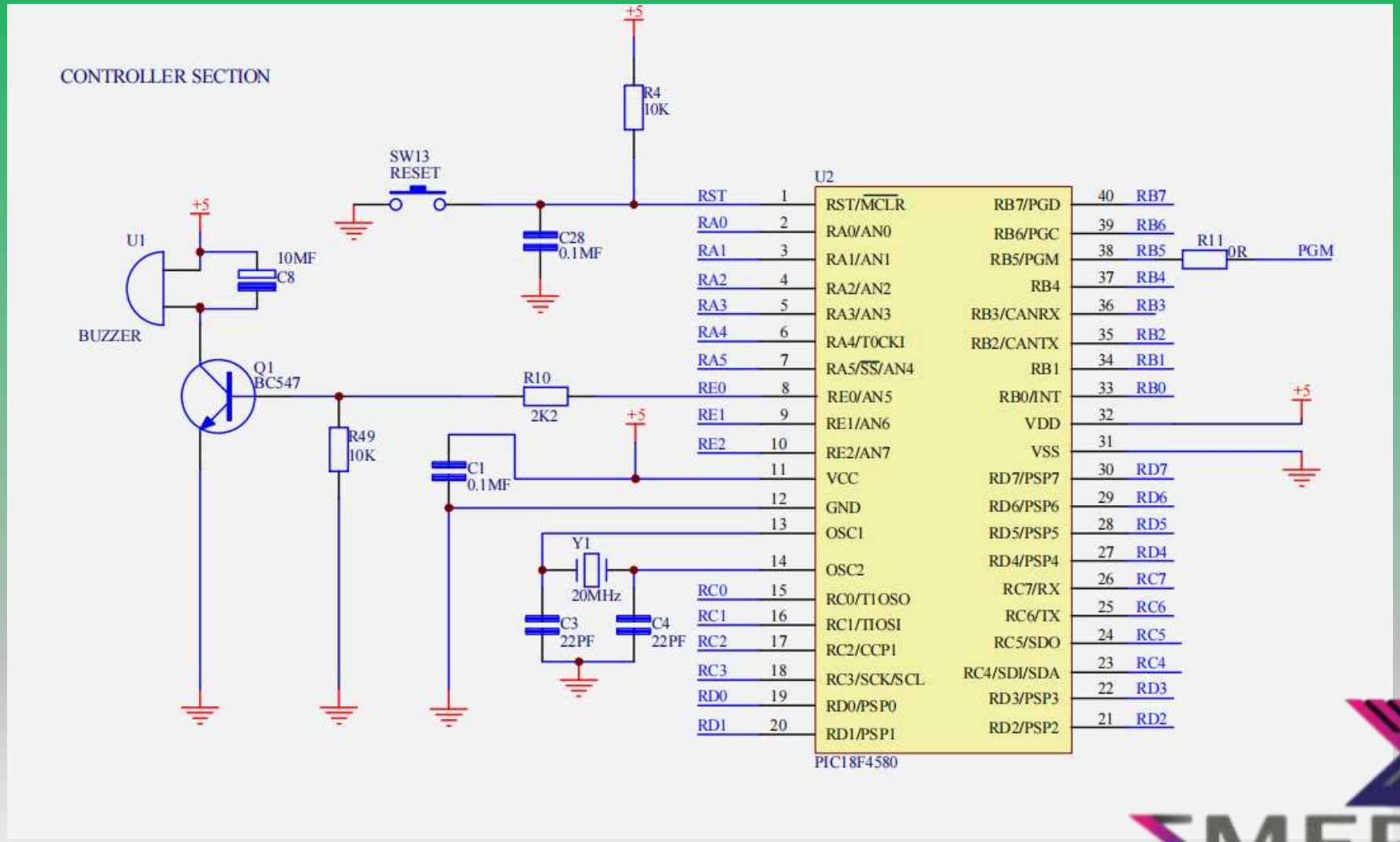
❑ Requirements

- **Software**
  - ➢ MPLAB X IDE V5.35
  - ➢ MPLAB X IPE V5.35
  - ➢ Tera Term
  - ➢ TinybldWin

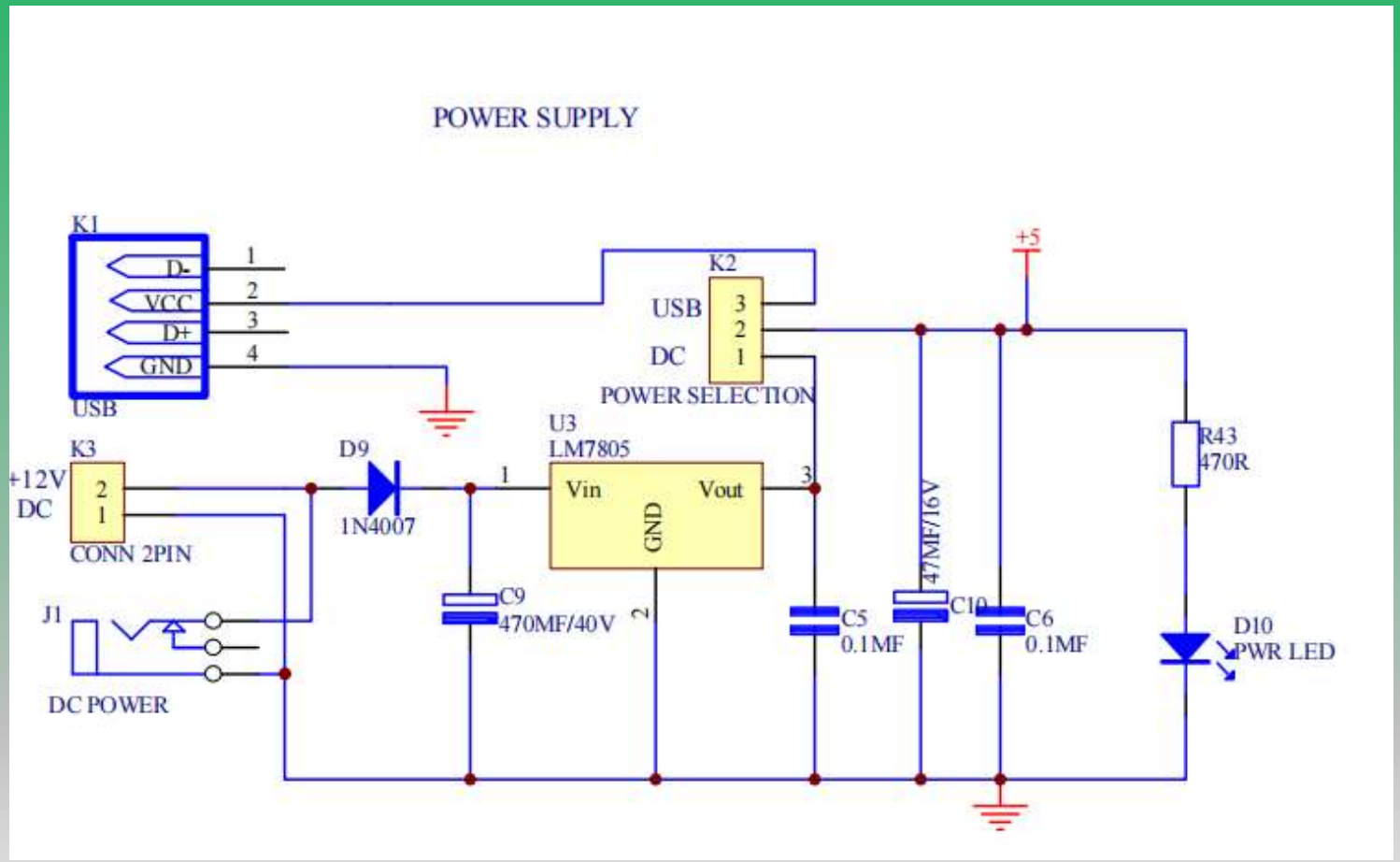
- **Hardware**
  - PicsimLab
    - ➢ PIC18F4580 Microcontroller
    - ➢ Display 16 x 2 CLCD
    - ➢ Matrix keypad (Switches)
    - ➢ Potentiometer
    - ➢ External EEPROM Memory
    - ➢ Microcontrollers
    - ➢ RTC(Real Time Clock)

✓ Knowledge of Embedded C is the basic requirement.

Schematic Diagrams



❑ Power Supply



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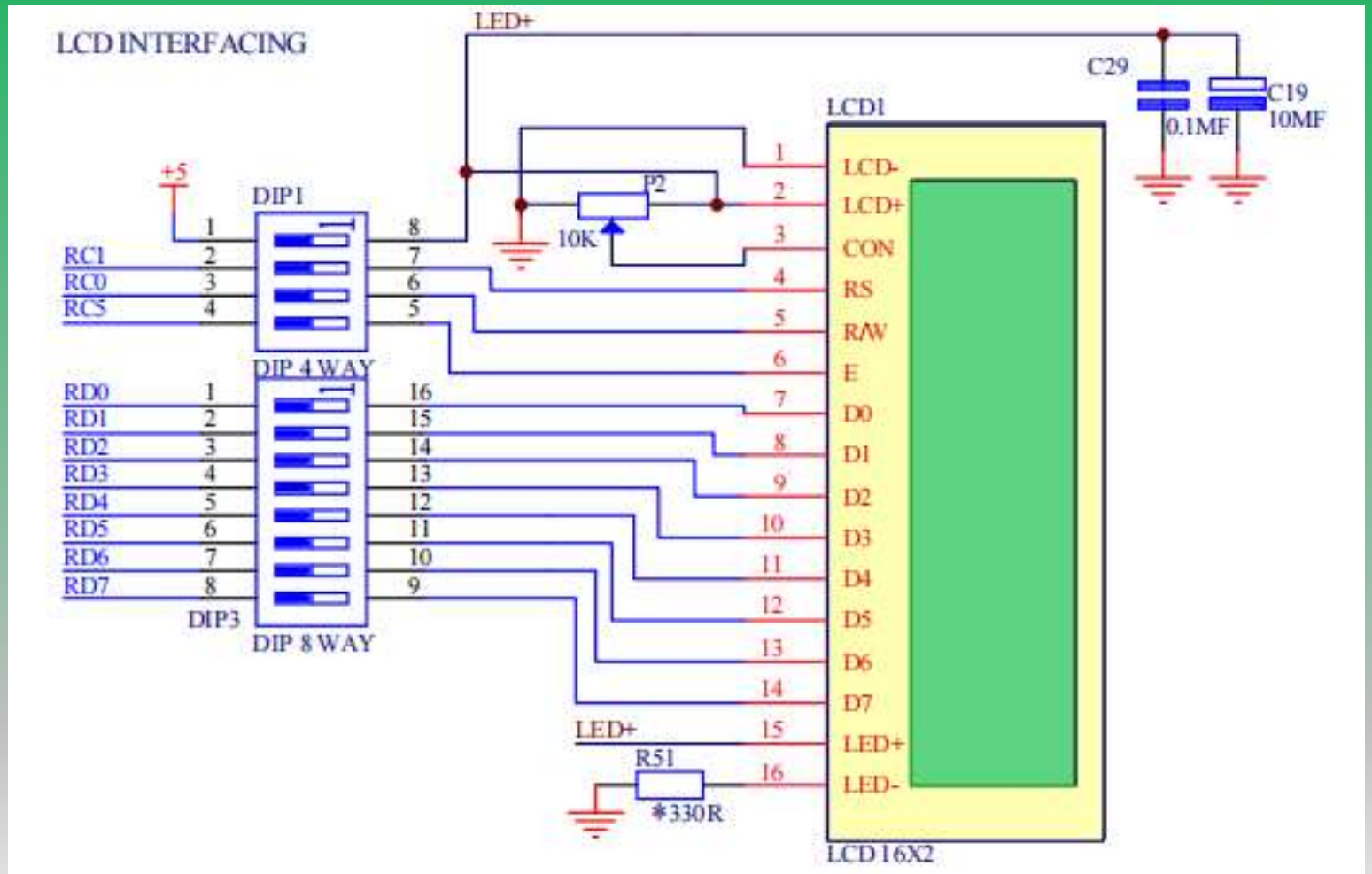
CLCD Interfacing



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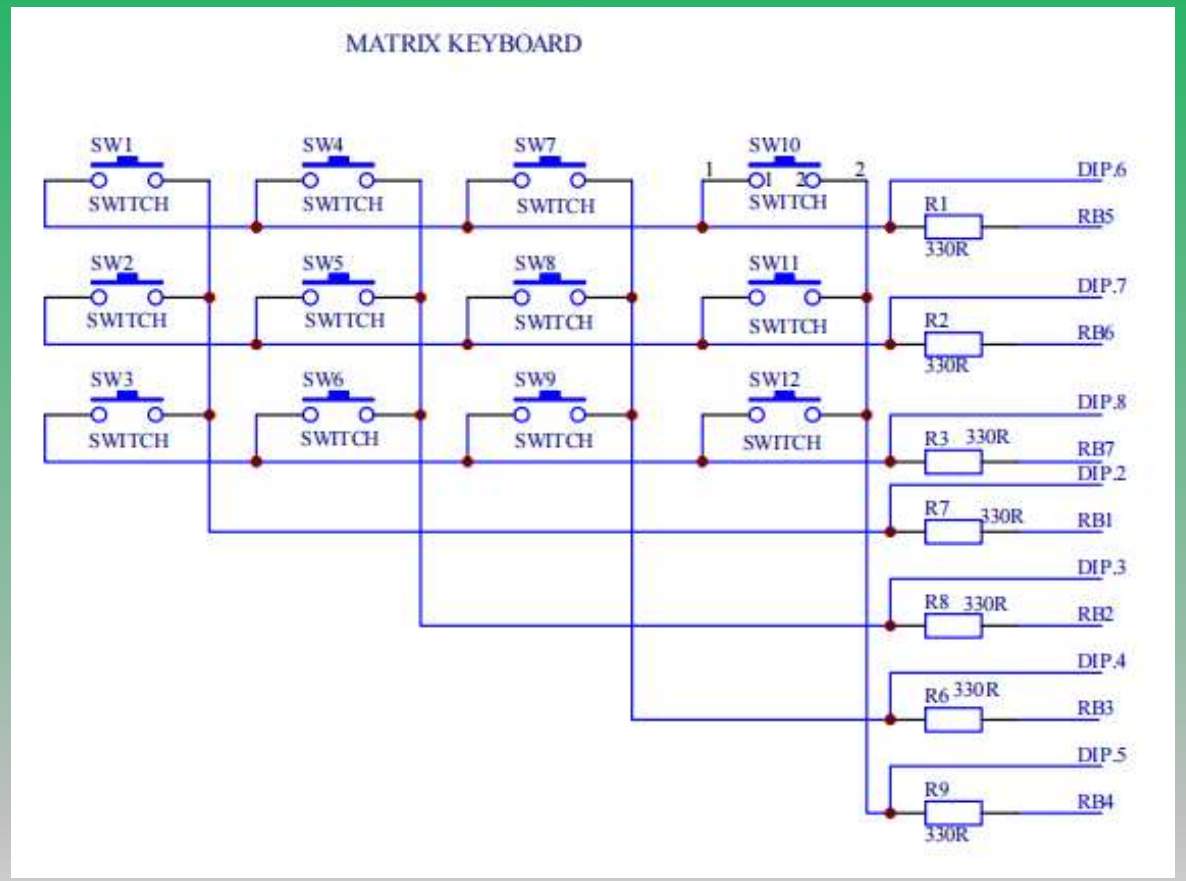
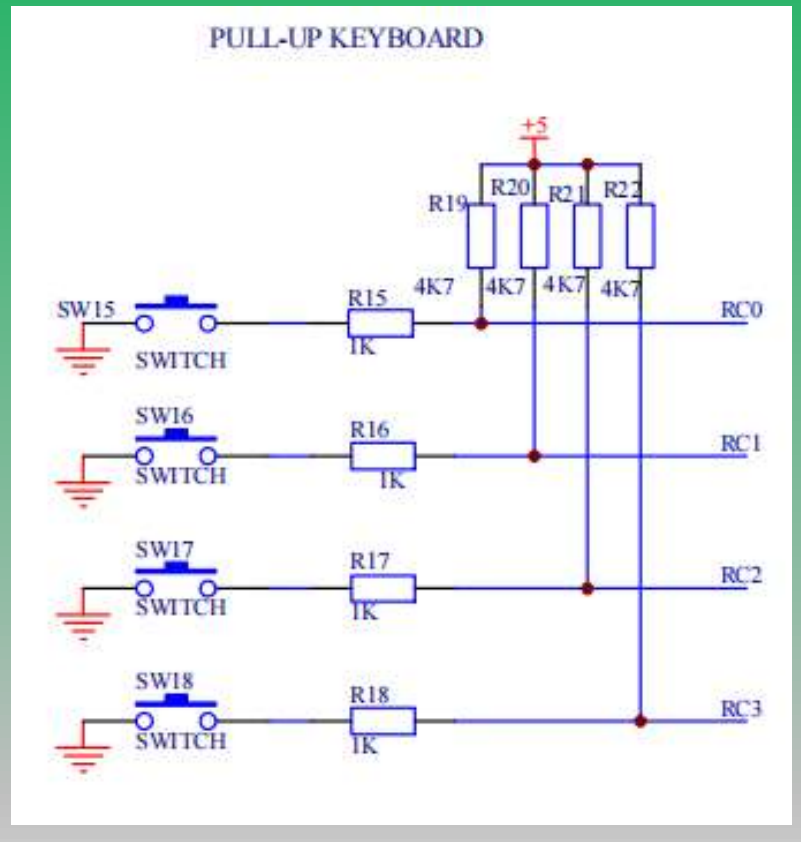
❑ Matrix Keyboard Interfacing





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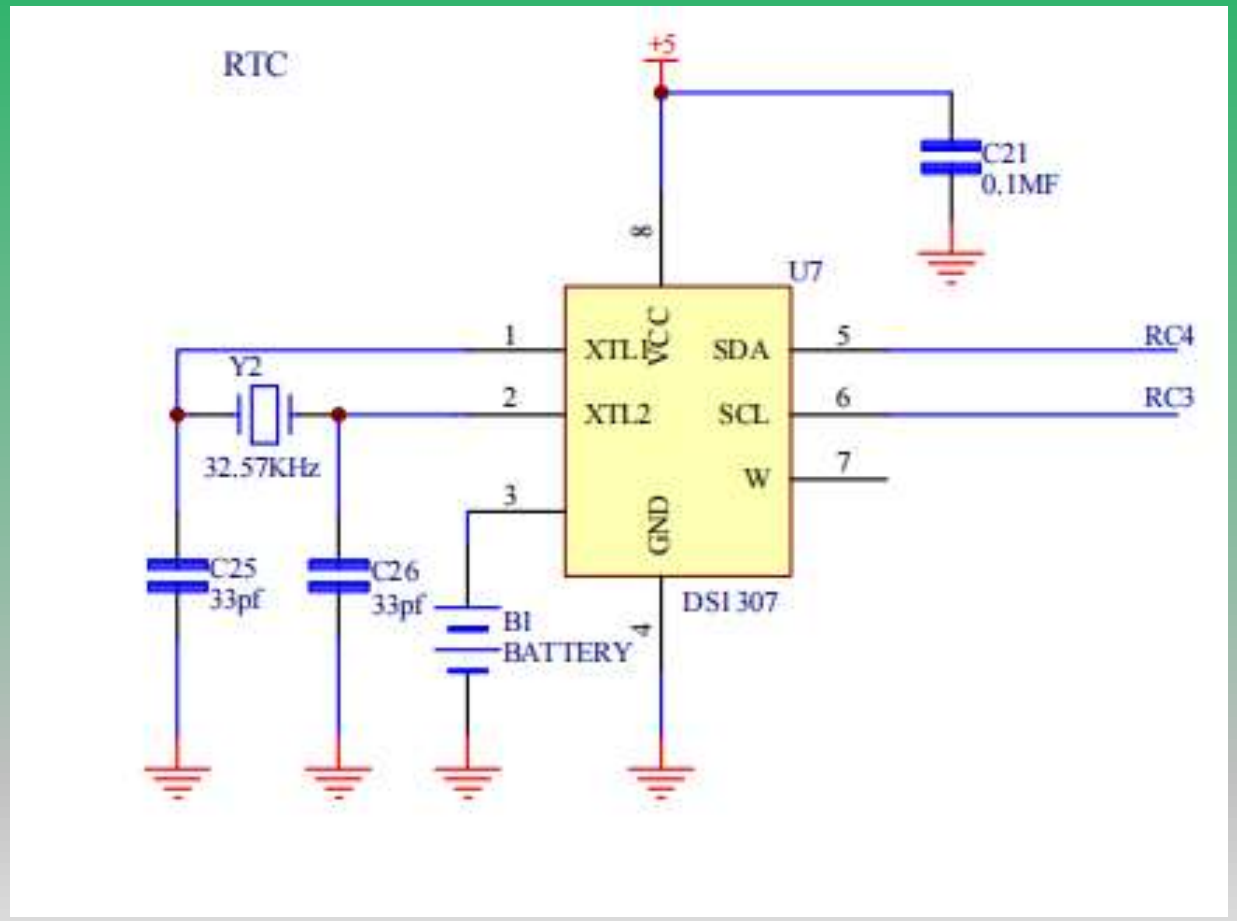
❑ RTC(Real Time Clock) Interfacing



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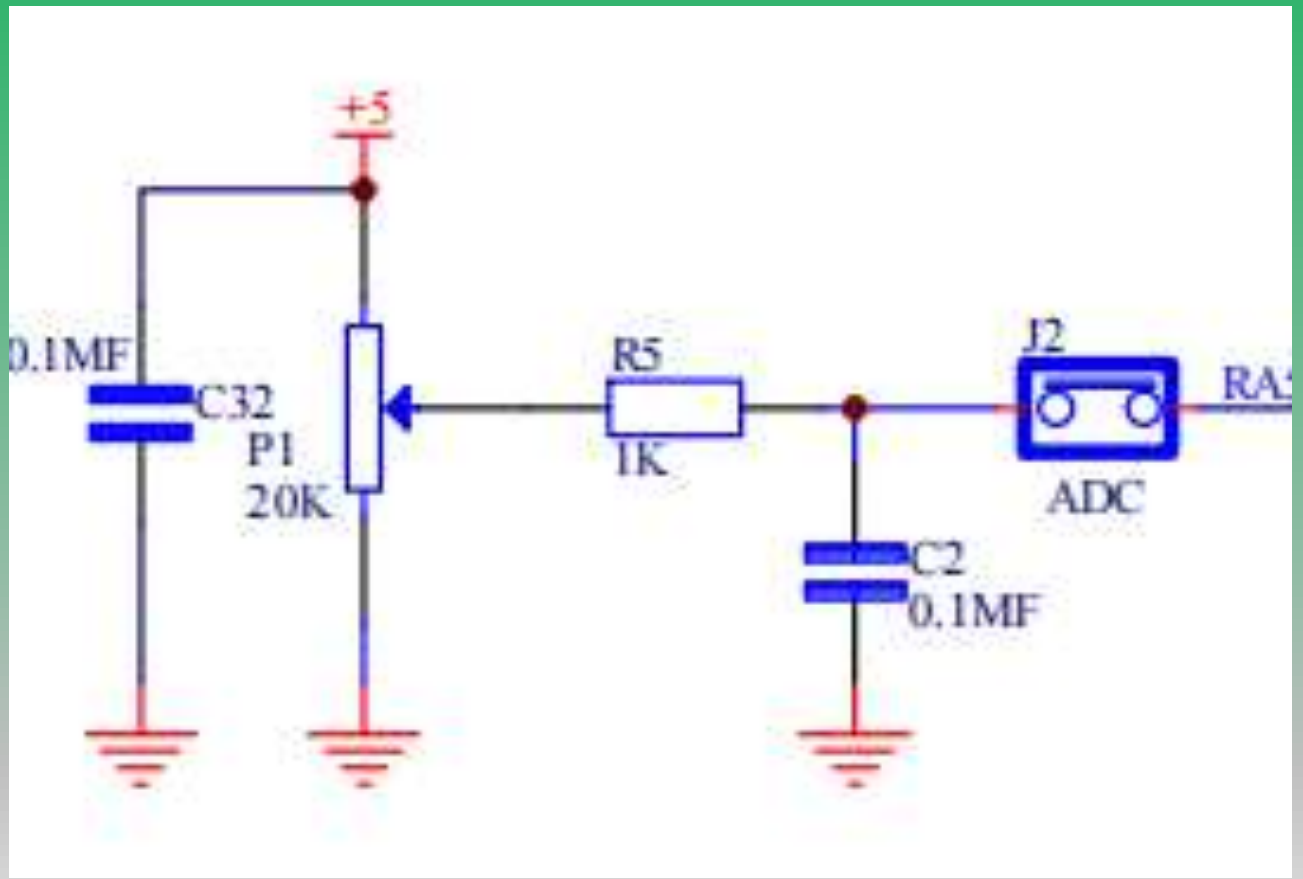
❑ ADC | Potentiometer



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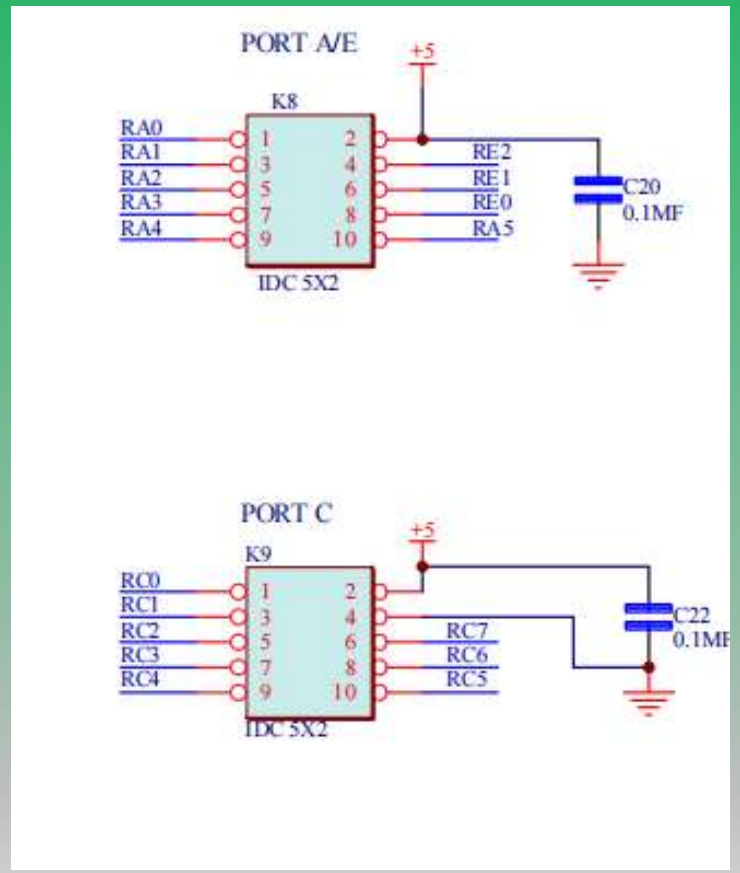
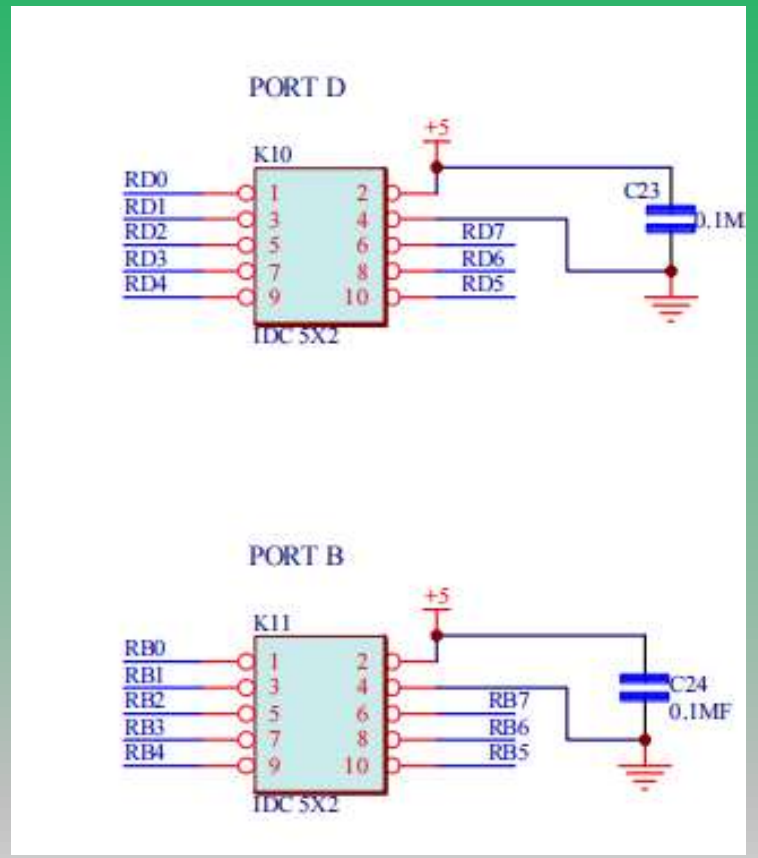
❑ PORT A/E INTERFACING





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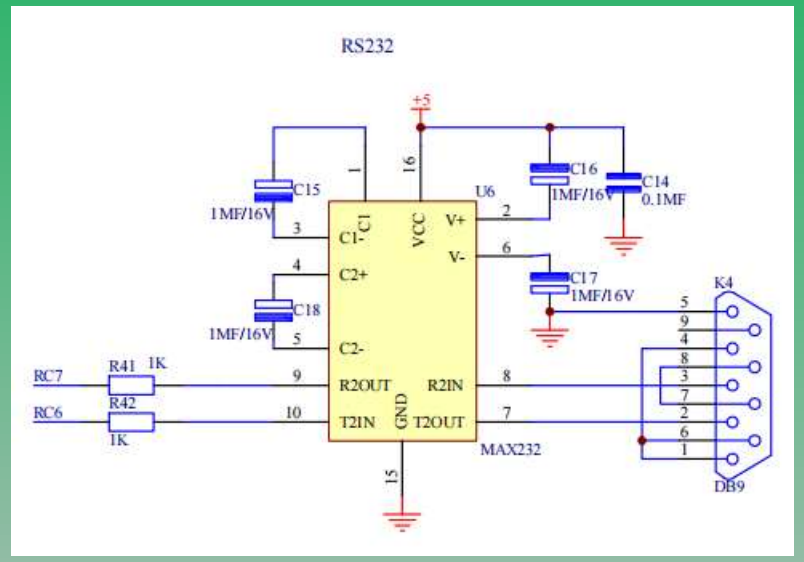
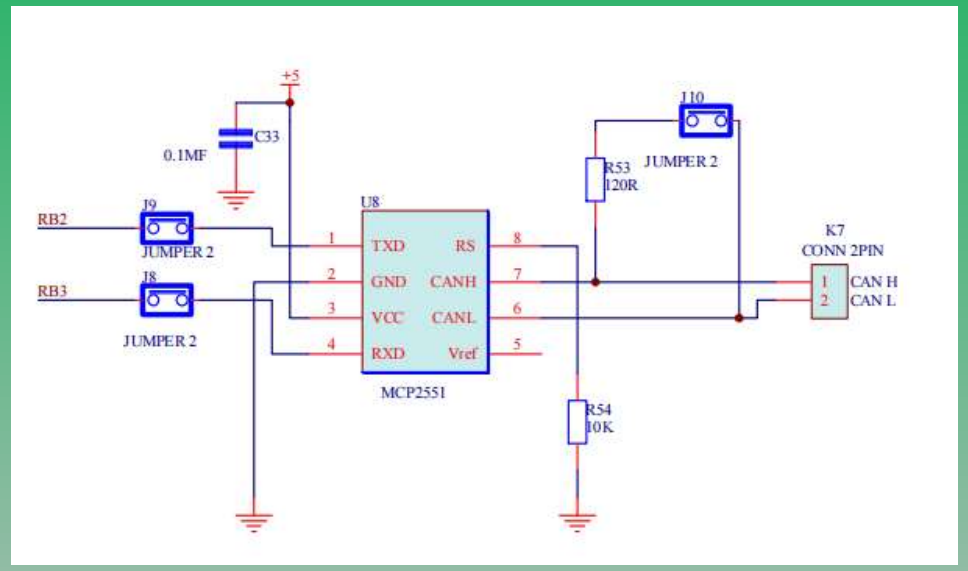
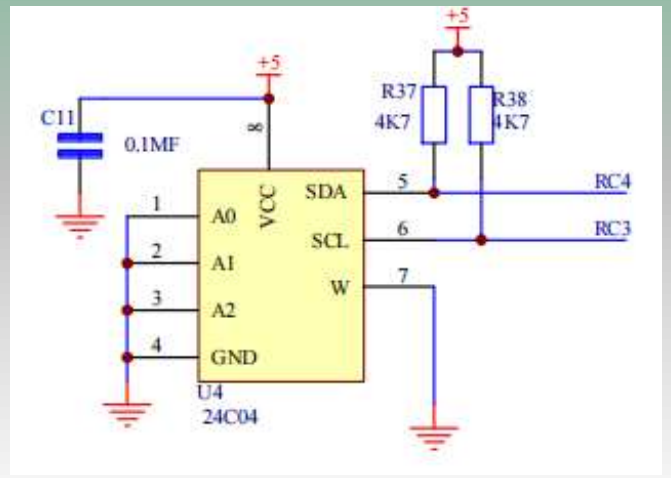
RS232 & MCP2551







❑ Project Requirement Details

- Default Screen

  ➢When the system is in Operation Mode, it would act like a dash board which would show the current time, speed of vehicle and the latest occurred event.

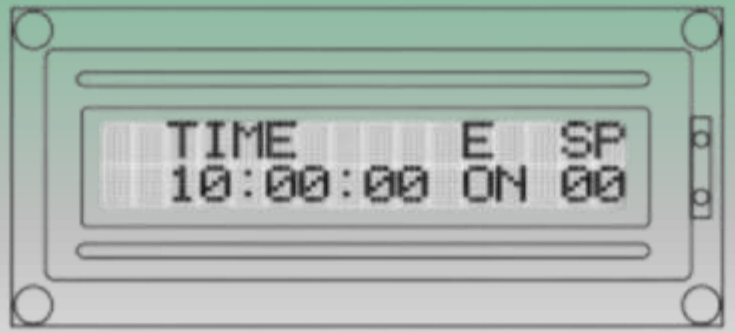


Fig 5 1: Default Screen. Should display the current time, The latest event captured and the current

❑ Login Screen

- On press of the UP or DOWN (User Keys) keys the system should prompt for password.
- The password would be the combination of 4 presses (User Keys).
- Each press should be denoted a "*" symbol.
- Every wrong entry would, re prompt for password (Max 3 times for every 15 minutes).
- Incomplete key press (pause of 3 seconds) would lead to Default Screen

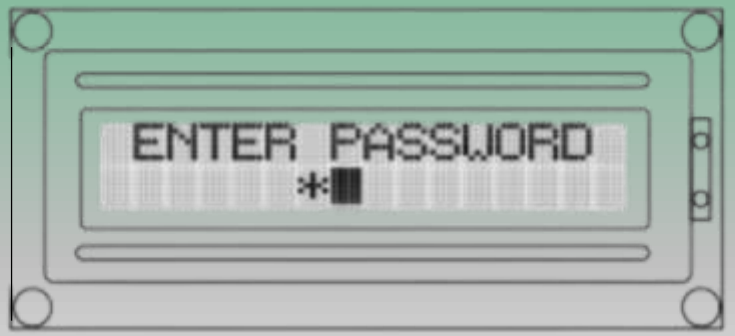


Fig 5 2: User Login.

The user needs to enter the password to browse through the available menu

❑ Main Menu

- The main menu should contain 5 option
  1. View Log
  2. Set Time
  3. Download Log
  4. Clear Log
  5. Change Password

Fig 5 3: The main menu

- The UP / DOWN keys are used to navigate
- A long press of UP Key should enter the selected menu
- A long press of DOWN Key should logout
- Idle screen for more than 5 secs should logout

Fig 5 4: The main menu

View Log

- Should display all the events captured with log index starting from 0, like “EVENT NUMBER” “EVENT SIGNATURE” “EVENT TIME” “SPEED AT THE EVENT”
- The UP and DOWN key will be used to scroll the entries
- Rollover on reaching the max log entries
- The system should be live (capture events occurred) even while viewing the log
- A long press of UP Key should take you back to main menu
- A long press of DOWN Key should logout

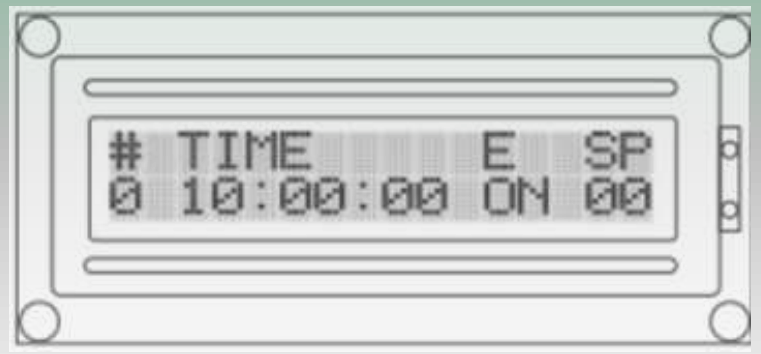


Fig 5 5:
The Log screen. Pressing holding the UP key in the main menu should take you this screen

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❑ Set Time

- Should show the current time. The Secs field should blink indicating the field to be changed
- The UP key should be used to increment the time. Rollover on reaching max
- The DOWN key will be used to choose the field.
- A long press of UP Key should take you back to main menu

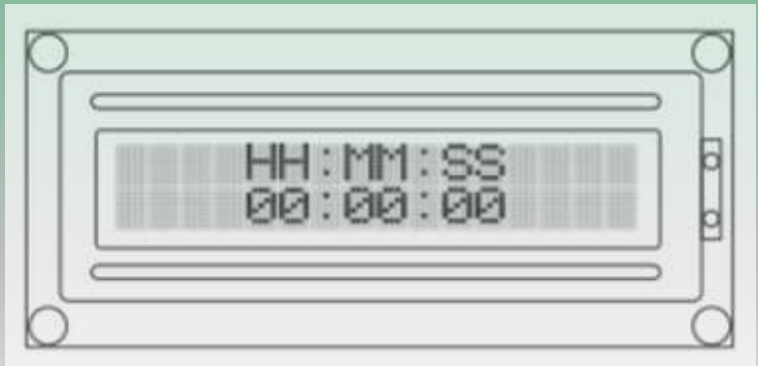

Fig 5 6: Time Setting Screen

Clear Log

- All logs should be Cleared.
- It displays Logs cleared Successfully.
- In events clear log is stored as a event.
- A message appears on the screen saying that the Log is cleared from the External EEPROM. Now, in the View log mode; rest of the Events will not be visible to User. Scrolling operation will be ineffective.

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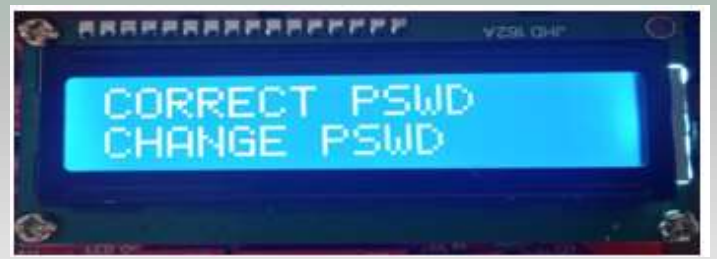
❑ Change Password

- In reset password, we are asking new password from user and confirm password also.
- If both are matching, then storing the new password in EEPROM. i.e we are setting our new password as password.
- Displays “Password changed successfully”.



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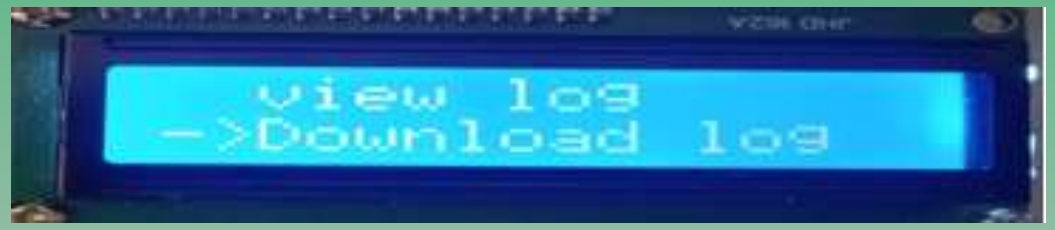
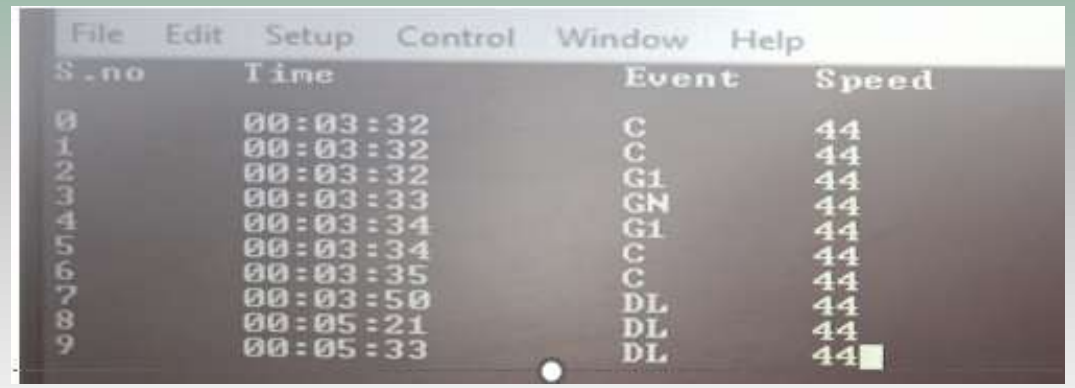
❑ Download Log

- It sends the data to laptop which is stored in EEPROM.
- Displays the Download logs successfully.
- User has to open the Serial terminal like Minicom, on the PC and connect the board with it using UART communication. After Long pressing the Download log option, the Data log will be printed on the Serial monitor.





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❑ Application

- The Black box can be installed in some automobiles to record various events. These events which are electronically sensed can often proactively detect any issue in the vehicle .
- For example : Engine fault
- Monitor the fleet (Driver over speeding)
- By doing pro-active maintenance of the automotive vehicle.

❑ Conclusion

- By implementing car black box which would log critical activities on the car and take appropriate action in case of rash driving. Negligence in the driving would be meeting the daily schedule and go off duty or to earn extra money. So by implementing the mentioned solution it would be easy to track how the vehicle is being used, handled and the efficiency of the vehicle.
- The proposed solution is to log all the critical events like the gear shifts with current speed , and time. The system should allow to get the information stored in the black box by using the password to view or download the log If required.

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❑ References

- Event Data Recorder – Wikipedia
- Car Black Box – A sample technical specification
- Download project document in PDF format

➢ *EL FIN [THE END]*

❖Thank You