Microprocessors

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Title: PIC Based Car Battery Voltage Monitoring System

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Project Description

Our project, PIC Based Car Battery Voltage Monitoring System, is designed to measure and display the voltage level of a car battery in real time. The purpose of the system is to help users monitor their car battery health and avoid unexpected failures. The system uses a PIC16F877A microcontroller as the main controller.

The core working principle involves using a voltage divider circuit to scale down the battery voltage to a safe level for the microcontroller's ADC (Analog-to-Digital Converter) input. The ADC module of the PIC reads this scaled voltage and converts it into a digital value. This value is then displayed on a 16x2 LCD screen for the user to see.

When powered on, the system continuously reads the battery voltage, converts it using the ADC, and updates the LCD display. This allows the user to see the real-time voltage status of the car battery.

System Workflow

1. **Power-On:** When the system is powered on, the microcontroller initializes all the ports and modules (ADC, Timer, LCD).
2. **Input Reading:** The system continuously reads the analog voltage from the battery using the ADC interface.
3. **Processing:** The digital value is calculated to determine the actual battery voltage.
4. **Output:** The voltage is displayed on an LCD screen, and if necessary, a buzzer or warning LED is activated.

Main Components

- PIC16F877A Microcontroller
- Voltage Divider Circuit (resistors)
- LCD Display (16x2)
- Buzzer or LED (for alerts)
- Battery (12V typical car battery)
- Power Supply Module (e.g., 7805 regulator)

Interfaces Used

GPIO (General Purpose Input/Output):

- Used to control the LCD display, LED, and buzzer.
- Also used to read digital signals if any button interface is added.

ADC (Analog-to-Digital Converter):

- Converts the analog voltage from the battery into a digital value that can be processed by the microcontroller.

Timer0:

- Used to generate time delays or trigger periodic tasks, such as refreshing the display or reading voltage at intervals.

Conclusion

In this project, we plan to design a system that can measure and display a car battery's voltage using the PIC16F877A microcontroller. The purpose is to help users keep track of their battery health and avoid problems caused by low voltage. We will use a voltage divider, the ADC module, and an LCD screen to show the voltage in real time. The project will also include basic interfaces like GPIO, ADC, and Timer0.

After completing the design, this system will be a useful tool for monitoring car batteries and a good example of using microcontrollers in real-life applications.

Submission:

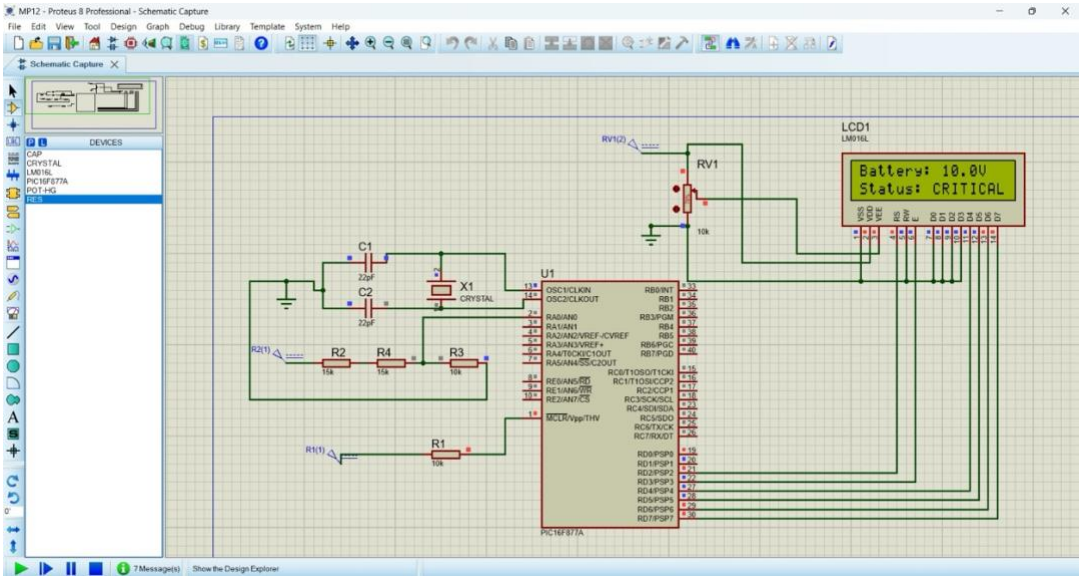
You can reach our code here: https://github.com/azrakarakaya1/battery-voltage-monitoring

This program runs on a PIC16F877A microcontroller and is used to check a car battery's voltage and show the result on an LCD screen. It reads the battery voltage using an analog input (RA0/AN0), calculates the actual voltage, and displays both the voltage and battery condition on the LCD. The LCD works in 4-bit mode, and the timing is controlled using simple delays (like waiting 1 second), not timers. The program updates the screen only when the value changes, so it doesn't flicker.

Expected LCD Output Based on Battery Voltage:

Voltage (V)	Status Shown on LCD
> 14.8	Status: HIGH
14.4 – 14.8	Status: CHARGING
13.8 – 14.3	Status: GOOD
12.6 – 13.7	Status: OK
11.5 – 12.5	Status: LOW
< 11.5	Status: CRITICAL

Circuit design in Proteus:



Actual circuit output: