Faculty of Engineering and Natural Sciences

Department of Computer Engineering

CMP3006 - Embedded Systems Programming
Term Project Report

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1 Alarm Clock Project

The main goal of this project is to build a simple alarm clock using Arduino Logic Board and other hardware components. Below is the description to achieve this and the methods used.

1.1 Hardware Components

- Arduino Uno board
- DS3231 RTC board
- 20x4 LCD screen
- 3 x Push Button
- 2 x Resistor
- Red LED Light

1.2 Project Description

In this project I used the DS3231 board, this board basically contains the main chip which is the DS3231, two pull-up resistors of SCL, SDA and INT/SQW lines and coin cell battery holder.

The RTC board has a built-in two alarm functions and a temperature sensor with a resolution of 0.25 and an accuracy of 3C which make this project a lot easier. The RTC board is supplied with 5V as the 20x4 LCD screen, 5V comes from the Arduino

board, there are 3 data lined connected between this board and the Arduino, SCL line is connected to analog pin 5, SDA is connected to analog pin 4 and INT line is connected to digital pin 2 which is the external interrupt pin of the Arduino. The RTC board interrupts the micro controller when there is an alarm.

In the circuit there are 3 push buttons: B1, B2 and B3. These buttons are used to set time, calendar and alarms. Time and calendar can be adjusted with B1 and B2, button B1 selects time or date parameter (time parameters: hours and minutes; calendar parameters: day of the week, date, month and year) and B2 increments the selected parameter. Buttons B3 and B2 adjust alarm1 and alarm2 parameters (hours, minutes and ON/OFF), button B3 selects the parameter and B2 increments the selected parameter.

There is an LED connected to Arduino pin 12, this LED is used as an alarm indicator (alarm1 or alarm2), so if there is an alarm the RTC board pulls down the INT pin which interrupts the micro controller and the micro controller turns the LED ON, here button B2 turns both the LED and the occurred alarm OFF. The Arduino turns the LED ON when it interrupted by the RTC board, the device sends the interrupt signal when there is an alarm. Button B2 acts as a Snooze button. If both alarms are active, button B2 will resets and turns OFF the occurred alarm only and keeps the other as it is. To do that we've to detect which alarm has been occurred which can be easily done by reading the status register of the RTC board which is A1IF and A2IF flag bits. Turning ON or OFF an alarm is done by writing to the control register bits, INTCN, A1IE and A2IE.

1.3 Schematic

The figure below shows the circuit schematics which is built using Proteus 8.

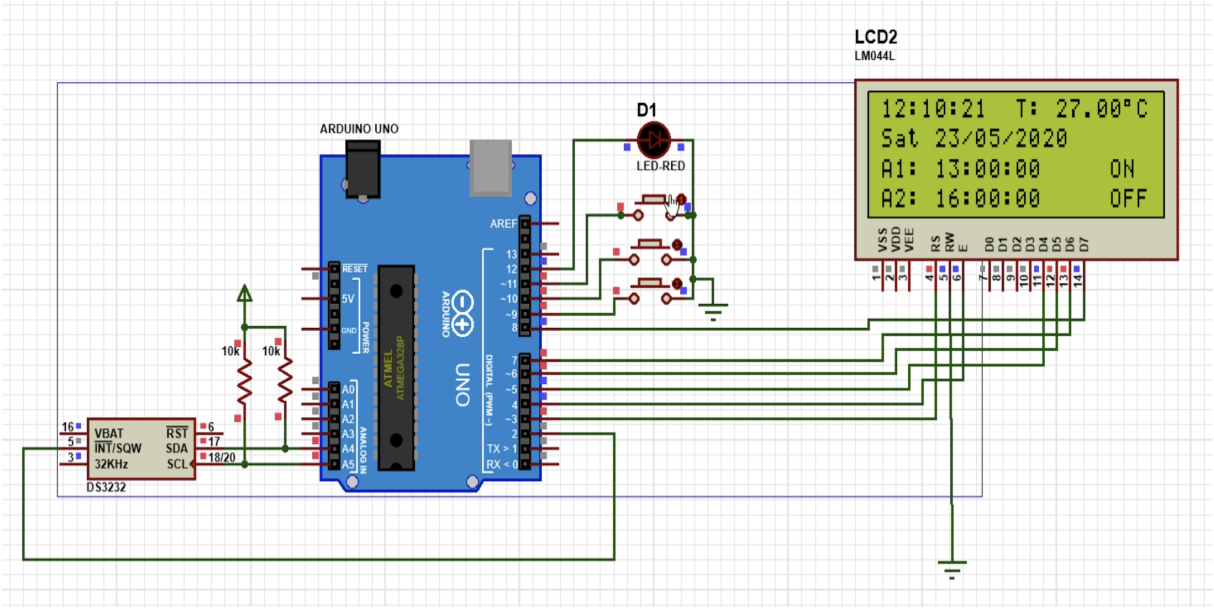

Figure 1: Circuit Schematic