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RTC ALARM CLOCK DESIGN PROFILE

Overview:

The real-time clock (RTC) embedded in STM32 microcontroller acts as an independent BCD timer/ counter. The RTC can be used to provide a full-featured calendar, alarm, periodic wakeup unit, digital calibration, synchronization, time stamp, and advanced tamper detection.

The alarm should be set directly from the lab board. When the board is connected to a PC, it should be possible to set the time from the workstation

Background:

The clock will display the current time using the system clock. For this we will be using LEDs to represent the time. The alarm on the board will then ring using the GPIO controlled buzzer to let the user know of the time. The alarm can be triggered by setting the time using the button. The design is similar to the existing alarm clock system with the addition of displaying time using the LEDs on the board. The time on the clock will be displayed in a 12 hour format.

The clock starts by making the west and north LEDs on if it's PM. The LEDs go off and the current time is displayed on the LEDs.
The time is displayed in the following format if the time is 2.35 PM.

The clock will start off with north and west LEDs on to indicate its PM. It will then auto switch to display the current hour, that is 2 by glowing the North-East LED (LED number 2 on the board). On user button press, the clock is switched to display tens place of minutes, in this case, 3 for which the East LED will be turned on. On pressing the button again, the units place of the minutes will be displayed, here its 5, South LED. For displaying time after 8, say 11, first four LEDs will glow together (LEDs 1 to 4) indicating the time to be 11 and so on for other timings.

The alarm can be set in 24 hour format. To set the alarm the user has to toggle using the extra button that has been initialized on the board. For that, the clock takes the input for setting the time in the same order as the time is displayed i.e. at first, the hours, then the tens place of the minutes and then the units place of the minutes. The user has to press the button for the corresponding time which is displayed by the LEDs in a sequential manner so that the alarm is set at the correct time. The user is notified when the time is set. The alarm can also be reset by pressing the button. The user is notified when the time is set. The user won't be able to input wrong time and the user will be asked to reset the time again.

Assumptions:

Usage: The clock takes Ultra Low Power as an input when it is connected to the workstation. The alarm clock can also function when not connected to the workstation using a 9 volt PP3 battery. The user can set the alarm from the workstation in a 24 hour format. The clock is programmed so as to display the defined time using 8 LEDs on the board. The user won't be able to input incorrect time and will have to give the specific time again.

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Environment: The device is not affected by external conditions such as temperature, humidity, etc. When on battery power, the temperature should be in the range of -18°C to 55°C (0°F to 130°F)

Objectives/Deliverables:

Category	**Design Objective**	**Deliverable**	**Status**
Power	Battery life	Based on the usage	Completed
Power	Battery availability	Uses commercially available 9 volt PP3 battery	Completed
Communication	Setting alarm directly from the board	Use the button to set the alarm time in 24 hour format.	Completed
User Interface	Alarm ring	Provides audio output using the GPIO controlled buzzer. Alarm goes off after 1 minutes	Completed
User interface	Time display	Use the 8 LEDs provided on the board to display time.	Completed
User interface	Resetting alarm	Use the integrated button to reset the alarm	Completed