

Leonard Chau  
Professor Jonathan Song  
Assignment 4: Project Idea  
Due October 16, 2024

### Project Idea: 3-Panel Analog Voltmeter Clock

My project device consists mainly of one Arduino board, three analog voltage panel meters (d'Arsonval galvanometer mechanism), one real-time clock (RTC) module, one analog limit-switch button, and one three-pin rotary encoder. The RTC features an external battery and an improved timekeeping mechanism to maintain proper time even when not powered. The RTC module *DS3231* with the *uRTCLib* library allows the Arduino to access the RTC module and read and update the current time. Every quarter-of-a-second, the RTC module's current hour (1-12), minute (0-59), and second (0-59) value is obtained and stored to three separate variables. The variables are used to generate three 0-255 variables intended for three 0-5V PWM outputs for hours, minutes, and seconds. The analog voltage panel meters have a swinging needle that sweeps from 0-90 degrees when 0-5V across its terminals is applied. With the legends of the analog voltage panel meters modified to read 12-12 hours, 0-60 minutes, and 0-60 seconds, they will be connected to their respective 0-5V PWM outputs. A button present on the device enables the user to modify the current hours, minutes, and seconds value by turning the rotary encoder while having the button pressed to increase or decrease the value. The current value is indicated by the analog voltage panel meter's needle position. When a single time parameter is being changed, the remaining time parameters are set to zero, so only the active time parameter being changed is visible. Upon button release, time display returns to normal with the updated value. Upon the next successive button hold-down, the next time parameter is allowed to be changed, and this repeated in a cyclic fashion to be able to repetitively cycle through the changing of the hours, minutes, and seconds values.

Flowchart:

