AUDIOMETER ('eh?M3')

You are to write software for the P24 microprocessor board which permits operation of the board as the 'eh?M3' audiometer (hearing tester).

The eh?M3 will:

1) **display frequency:** turn on LED1 and display the test frequency (125Hz to 8000Hz) on the four 7-segment displays when the 'FREQUENCY' mode switch (SW9) has been pressed. Test frequency will default to 125 Hz at power-on, and will otherwise resume at its most recent setting for other adjustments.

2) **adjust frequency:** test frequency is to be adjusted using switches 1-8, with each switch pair 1/2, ..,7/8 acting to adjust the digit above the switch pair up/down in single steps at each switch press.

3) **display intensity:** turn on LED2 and display the test intensity (-10db to 110db) on the four 7-segment displays during a test when the 'TEST' mode switch (SW10) has been pressed. Test intensity will default to -10db at power-on and whenever the test frequency is changed..

4) **adjust intensity:** while in TEST mode, intensity is to be adjusted up/down in 5db steps for every 2 CW/CCW detent-stops (8 phase-steps) of the rotary encoder.

5) **generate tones:** using the onboard CS43L22 audio DAC with DMA.

6) **present tones:** while in TEST mode, test tones will be switched on/off by successive presses of the TEST switch. LED6 will blink at 3 Hz while the test tone is 'on'.

7) **record responses:** while in TEST mode, the "RECORD" switch (SW12) will be monitored for patient-input and the frequency and intensity at the time of switch-press will be recorded .

8) **erase current response:** while in TEST mode, the most recently recorded sample may be erased by pressing "REVIEW" (SW11) for less than 1 second.

9) **playback test results:** turn on LED3 to indicate REVIEW mode when SW11 is pressed for more than 1 second but less than 5 seconds. In REVIEW mode, pressing the RECORD switch (SW12) repeatedly will step the displays through the record of frequency/intensity accumulated while in TEST mode. The value displayed will default to intensity, but the frequency value in the record will be displayed whenever FREQUENCY (SW9) is held down.

10) **erase tests/reset system:** at any stage of device operation, if REVIEW (SW11) is pressed and held for 5 seconds, then turn on 'ERASE WARNING' (LED5) and blink it at 'w' Hz, where w= number of seconds since SW11 was pressed.. If SW11 continues to be held down for 10 seconds, turn LED4 ('RESET') on for 2 seconds and erase the recorded patient history, then return to the power-on reset state. Otherwise, return/remain in REVIEW mode.

additional requirements:

11) **Interrupt-driven display refresh:** use an interrupt to provide a 1 kHz display refresh.

12) **Interrupt-driven timekeeping:** use a separate interrupt to provide fractional second timekeeping.

13) **Communicate test-protocol scripts from the PC:** Send a text file containing a test-protocol script of your own devising from the PC to the P24 over USB.

14) **Record test results on the PC:** Send the result record previously displayed for requirement 9 (above) to the PC over USB for storage in a text file on the PC.

Submissions:

Your project-report should be submitted in a .zip file and will consist of:

-a PDF containing a written overview of the system design concept along with figures (flow charts, state diagrams, data diagrams, schematics) documenting the design and how it works;

-a PDF containing the User's Manual for the device;

-a PDF containing qualification and acceptance testing procedures for the device;

-a directory containing the **well-commented** source and build tools for the device programs and a readme for their use.

All submissions should be identifiable as to source (you) and application (440SP13_PROJECT)