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6.101: Project Check off Checklist
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Simple Heart Rate Monitor for Analog Enthusiasts

I. ECG Signal Generation

We plan to use either an ECG printed circuit board (PCB) or a function generator to obtain an ECG signal. Since the ECG PCB was already designed and demonstrated in laboratory 5, we do not expect it to feature on the check off list.

II. ECG Signal Transmission and Reception

Abigail is responsible for modulating the ECG signal to a higher frequency, transmitting it along the optical fiber as an optical signal, detecting the modulated signal, and demodulating it to obtain the pure ECG signal. The electrical signal will be converted to an optical signal using a diode transmitter, and back to an electrical signal using a photodiode receiver. The check off will be for signal modulation, transmission, reception and demodulation.

III. ECG Signal Amplification and Filtering

Jelimo is responsible for correcting the ECG signal for DC compensation, amplifying it, and passing it through a low pass filter to clean up the signal. The check off will be for signal DC compensation, amplification, and filtering.

IV. Pulse Rate Measurement

Abigail is responsible for converting the heartbeat frequency to a voltage using a capacitor (integrator circuit). The check off will be for frequency to voltage conversion.

V. Pulse Rate Display on an Analog Meter

Abigail is responsible for displaying the voltage across the capacitor that corresponds to the pulse rate, on an analog meter. Although the relationship between the pulse rate and voltage level is not linear, the deflection of the needle on the analog meter to different extents should be an indication of how fast or slow the heart is beating. The check off will be for the visual display of the pulse rate on an analog meter.

VI. Pulse Rate Display on a Speaker

Jelimo is responsible for producing a sound on a speaker that corresponds to the heartbeat. Every time the heart beats, a thump will be heard. She is also responsible for implementing an alarm that will indicate if the heartbeat is too high or too low. In this regard, she will demonstrate a class B amplifier to amplify the sound, and modulation of a square signal (80% duty cycle) that represents the peaks of the ECG signal to a higher frequency to produce the thumping sounds, and the beeping sound that serves as an alarm for an extremely low or an extremely high pulse rate.