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# Analog Heart Monitoring Alarm System

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Analog Heart Monitoring Alarm System

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### Abstract

The basic objective of the Analog Heart Monitoring Alarm system is to take the continuous beat rate of the human heart and to observe this rate giving an indication when the heart rate has exceeded adjustable maximum and minimum beat rates as selected by the operator.

When the heart beats, the heart muscle produces an electric impulse. These electrical impulses are picked up by three electrodes placed near the heart on the skin surface of the chest. Two of the electrodes are attached to "pick up sensors" and the third electrode is used as ground. The two sensors send their signals to a differential amplifier which will amplify the difference between the two potentials taken from the sensors. The result is a voltage pulse occurring with each heart beat. This voltage pulse is transmitted by a FM transmitter to a standard AM/FM clock radio.. It should be noted that the electrodes, sensors, amplifier, and FM transmitter are maintained on the subject. Telemetry is used to remove the information from the subject to another point. In using telemetry, a safety factor has been promoted by eliminating any wires or possible high voltages from coming in direct contact with the subject.

The voltage pulse is picked up from the FM receiver and fed into the main portion of the system. This section will analyze the pulse and indicate when the heart rate has exceeded set minimum and maximum points. Please note that this unit with the FM radio can be placed in another room away from the subject if necessary. Also it operates off of 110 volts ac 60 Hz.

The first stage of this unit is a Schmitt trigger which will square the input wave. This square pulse is then fed into an integrator circuit which will convert the square pulse into a triangle wave. The next stage takes this triangle wave and rectifies it, and from there the rectified triangle wave is fed into an averaging circuit which produces a dc voltage output.

This dc voltage will vary as the frequency of the input pulse varies. Therefore this system is in general a frequency to dc voltage converter.

Due to the low voltage variation it was necessary to put the dc voltage through three amplification stages. This amplified voltage is then fed into a window comparator. The comparator produces an output when the dc level input drops below or exceeds two adjustable reference voltages. These reference voltages are calibrated to known heart beat rates. Therefore

making it possible to detect when a subjects heart rate exceeds present rate points.

The window comparator output also had to be amplified and then placed across a dc buzzer and an indicator light which gives a sound and visual alarm indication.

This concludes a general summary of how the heart monitoring system works. A more extensive explanation of each stage will be found in the main body of this report.