SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Course Name: 19BMO302 & WEARABLE TECHNOLOGIES

Topic :Photoplethysmography

Semester :6

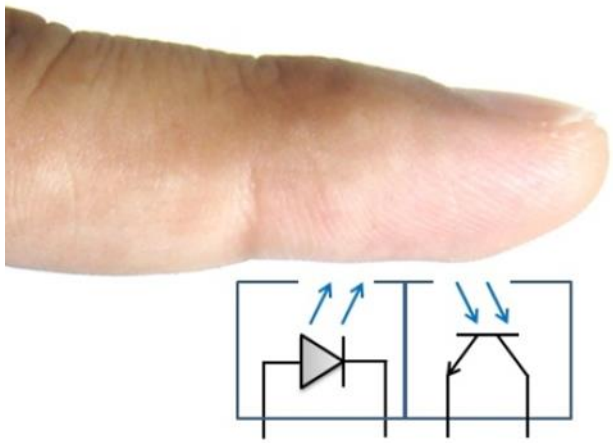
INTRODUCTION

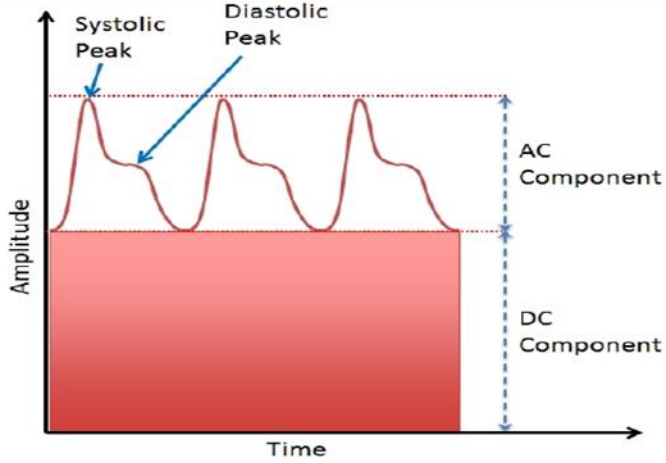
Constructing a device to measure heart rate, respiratory rate, blood pressure and oxygen saturation level in blood that is

- Cost-effective
- Noninvasive
- Simple and efficient
- Possible to interface with computers
- **One major objective is to measure these using only Smart Phones**

PPG SENSOR

- Photoplethysmography (PPG) is the volumetric measurement of an organ through optical means, resulting from fluctuations in the amount of blood or air it contains.





WAVEFORM OF PPG

FORMULA TO CALCULATE BP

- Blood pressure is strongly related to Pulse Travel Time (PTT)
- Formula for measuring Blood pressure follows :

$$P_{sys} = [k_1 \times (C_{dx})^2] + k_2$$

$$P_{dis} = [k_3 \times (C_{dx})^2] + [k_{HR} \times HR] + k_4$$

- C_{dx} is related to ECG Signal and PPG signal which is strongly related to T_1 and T_2.
- We derived a formula and take some measurements which produced very promising results.

NEED FOR SIGNAL CONDITIONING

External Biasing Circuit

- This part of the circuit provides reading from a sensor (TCRT1000, TCRT5000, and LTH1550-01) to detect change in volume of blood.

Vision Tit 2 Vision Title 3

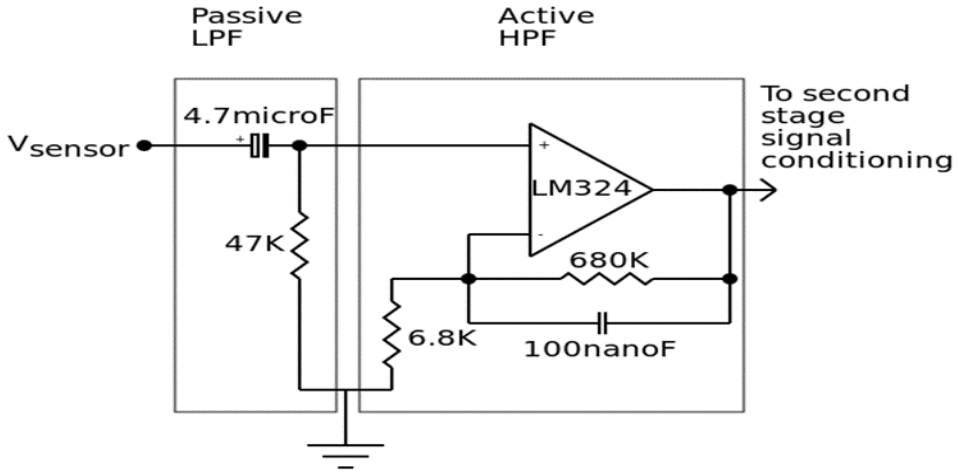
First Stage of Signal Conditioning

- This stage of the circuit removes the DC component of PPG signal using a high pass filter and it also amplifies the AC component by a factor of 101.
- An active low pass filter having a cutoff frequency of 2.34 Hertz is used to boost the AC component.

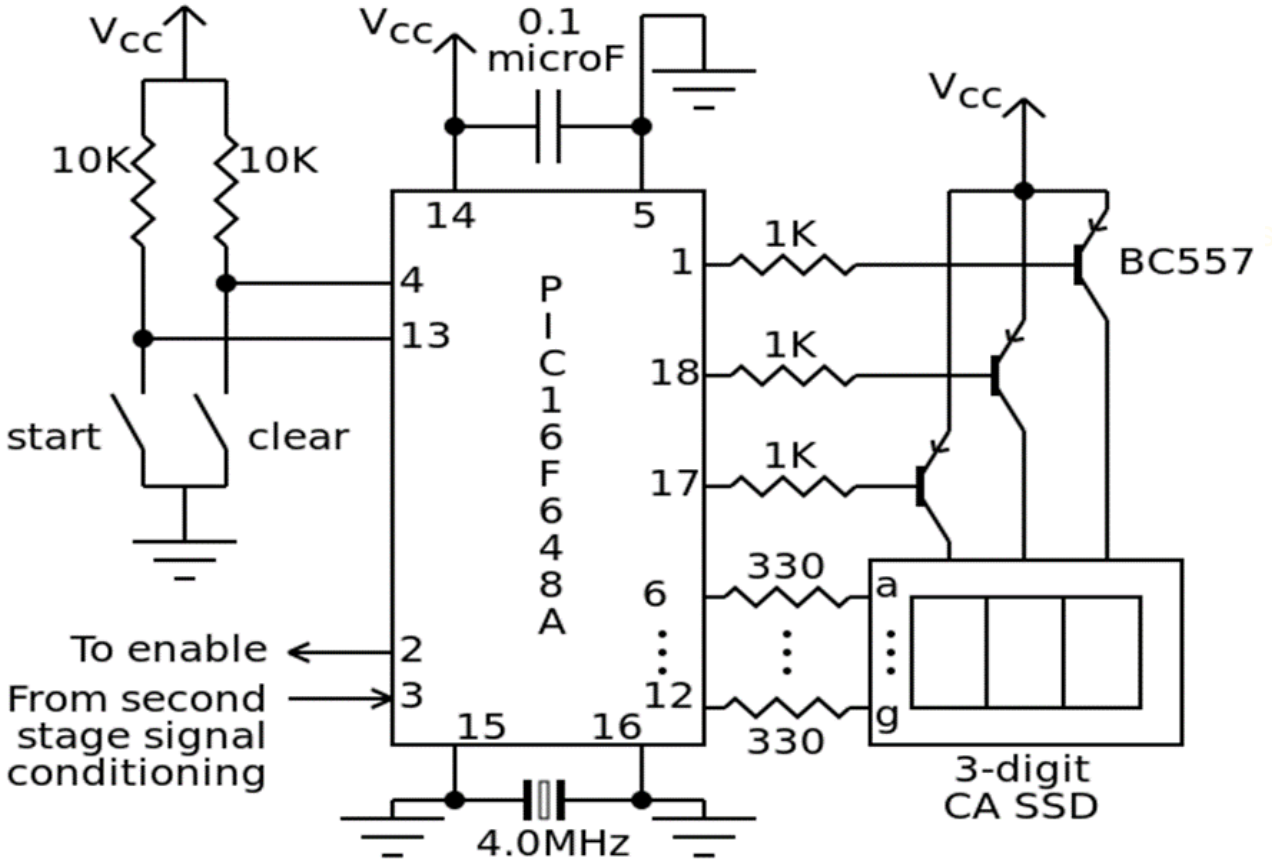
SECOND STAGE CONDITIONING

Second Stage of Signal Conditioning

- The second stage of signal conditioning is actually a clone of the first stage. This stage also provides a gain of 101, resulting in final gain of 10201.



INTERFACING WITH MICROCONTROLLER



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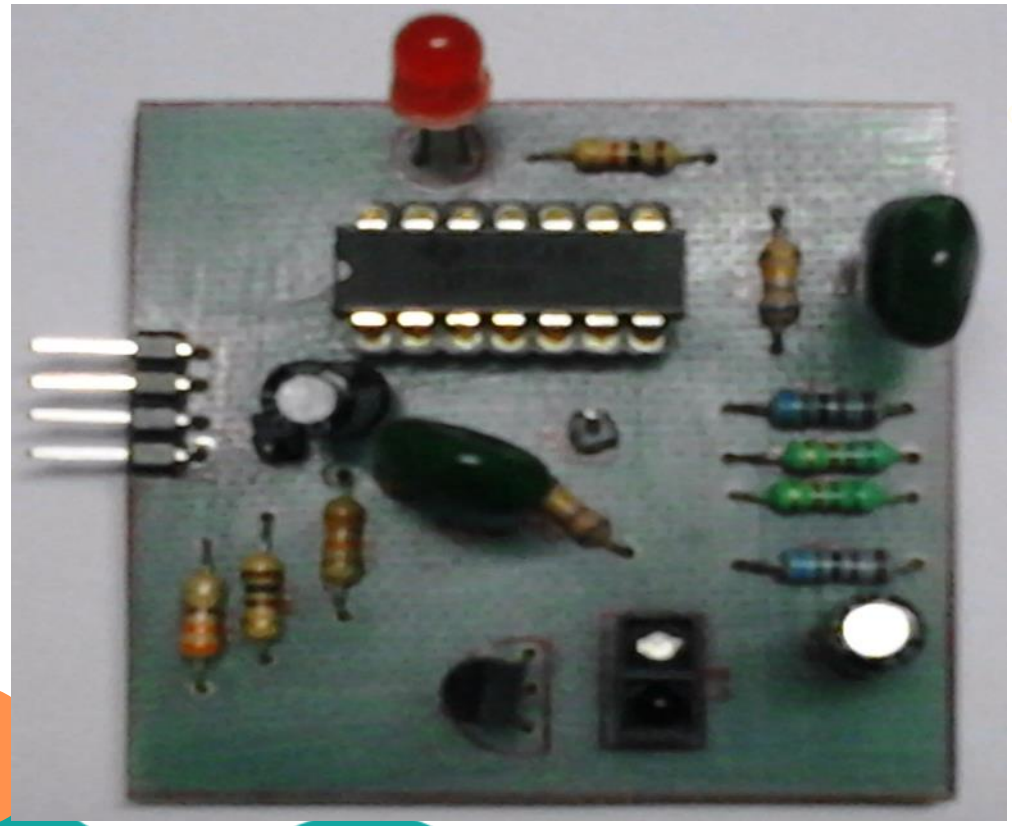

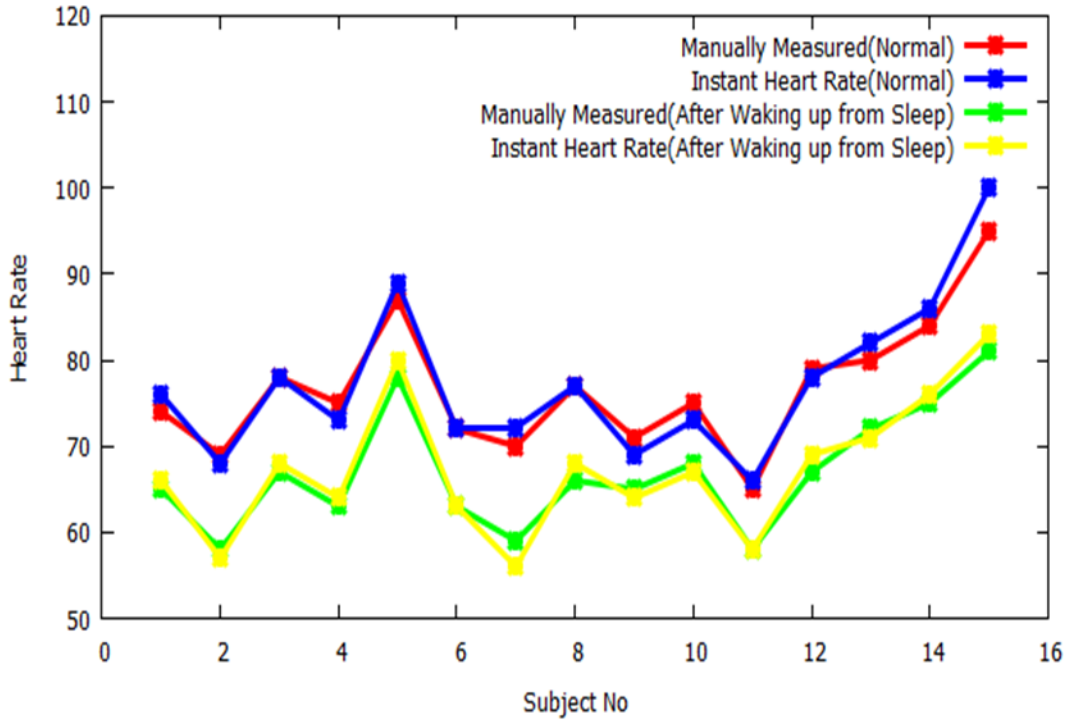

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