

A Finger Plethysmograph to Measure Blood Resistivity

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Function: Our goal is to design a finger plethysmograph to measure blood resistivity. Impedance plethysmography may be used to measure arterial volume change that occurs with propagation of the blood pressure pulse in a limb segment. For this measurement, we assume a constant value of blood resistivity. However, blood resistivity may change under both physiological and pathological conditions. Use of an impedance plethysmograph on a finger immersed in a salt-filled beaker may yield a simple method for determining blood resistivity. This may develop into a method that diabetics can use to measure glucose level noninvasively.

Design requirements:

1. Physical and Operational Characteristics

- a. *Performance requirements:* The device will be used extensively in research trials. The device should be able to provide consistent results over an entire research trial.
- b. *Safety:* The device will be designed so that the electricity used will not cause any harm to the user. The safety standards employed in this device should meet Institutional Review Board regulations.
- c. *Accuracy and Reliability:* The device should be able to obtain clearly discernable differences in blood resistivity.
- d. *Life in Service:* The device should be operable for a period of up to 6 months or until the completion of the necessary testing and evaluation of the prototype can be completed.
- e. *Shelf Life:* The device should be able to withstand prolonged periods of disuse without the need for extensive recalibrations.
- f. *Operating Environment:* The device should be compatible with standard clinical and laboratorial environments.

g. *Ergonomics*: The device must be able to accept a wide range of finger sizes, while minimizing finger mobility. The current draw must be limited so that the user doesn't experience any electric shock.

h. *Size*: The device's size must be such so that it doesn't interfere with the positioning of the finger and it can't hinder the data collection.

i. *Weight*: The device must be light enough so that it can be portable and wieldable by one person.

j. *Materials*: The materials of the device must be electrically inert where needed and such that they do not harm the human subject or collection of data.

2. Production Characteristics

a. *Quantity*: 1

b. *Target Product Cost*: manufacturing costs; costs as compared to existing or like products. \$25-\$100

3. Miscellaneous

a. *Standards and Specifications*: Must meet IRB standards for human testing and all other applicable standards and regulations.