

12-Lead ECG Trainer

Product Design Specifications

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Function:

An adult mannequin will be developed to be used for 12 and 15-lead ECG training. The mannequin should produce a variety of ECG signals. Students should place ECG electrodes on the chest using anatomical landmarks and the device should provide feedback about correct and incorrect placement.

Client Requirements:

- Placement of electrode leads should be found using anatomical landmarks
- Individual visual indicators for correct/incorrect placement of each electrode lead
- ECG signal output when all electrodes are placed correctly
- Endure daily use by students
- Battery operated
- Withstand cleaning using standard cleaning procedures

Design Requirements

1. Physical and Operational Characteristics
 - a. *Performance requirements:* The placement of the electrode leads should be found using anatomical landmarks including the clavicle, ribs, and sternum. Feedback should be given about the accuracy of the placement. When the electrodes are correctly placed, a variety of heart arrhythmias should be displayed. The devices should withstand daily use by students and should be able to be cleaned using standard cleaning procedures.
 - b. *Safety:* All circuitry should be insulated and hidden from the user to prevent shock. Wiring should be protected so that cleaning does not short-circuit the wiring.
 - c. *Accuracy and Reliability:* Electrodes must be placed within a 1 cm radius of the correct location to register as “correct placement.” The device should not disrupt or alter the transmission of the ECG signal.
 - d. *Life in Service:* The device should last five years of weekly use with cleaning after each use.
 - e. *Operating Environment:* The device should be water resistant to withstand cleaning. The device will be used in an indoor classroom environment by numerous students.
 - f. *Size:* The device should fit a standard adult CPR mannequin.
 - g. *Weight:* The device should be easily lifted by an average adult.
 - h. *Materials:* Ideally a material that mimics the electrical conductance properties of skin should be used. The material should be dark enough to hide underlying circuitry but also be able to transmit light from LED placement markers.

2. Production Characteristics
 - a. *Quantity*: One unit to be used by Dane County EMS
 - b. *Target Production Cost*: Cost must be affordable for the Dane County EMS.

3. Miscellaneous
 - a. *Customer*: The client wants a visual indicator for correct/incorrect placement of *each* electrode lead and an ECG printout when all leads are positioned correctly.
 - b. *Competition*
 - i. *12 Lead ECG Placement Trainer*, Armstrong Medical
 1. Correct placement for electrodes are visibly marked
 2. expensive (\$865)
 - ii. *12 Lead Task Trainer*, Laerdal
 1. Correct placement for electrodes are visibly marked
 2. expensive (\$8299)