

Knowledge Domain: Mechanical
Unit: Calibration
Skill: ECG Monitor

Tools and Parts Required:

- 1) ECG that requires calibration
- 2) A test patient
- 3) Alcohol swab
- 4) Watch that counts seconds

Introduction

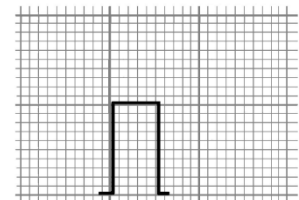
Electrocardiographs (ECGs) monitor the electrical activity of the heart. ECGs are used to detect heart attacks or diagnose abnormal heart rhythms. ECGs are found in ambulances, intensive care units, and other healthcare facilities. Sometimes ECGs also have an apnea monitor. Apnea monitors detect changes in breathing.

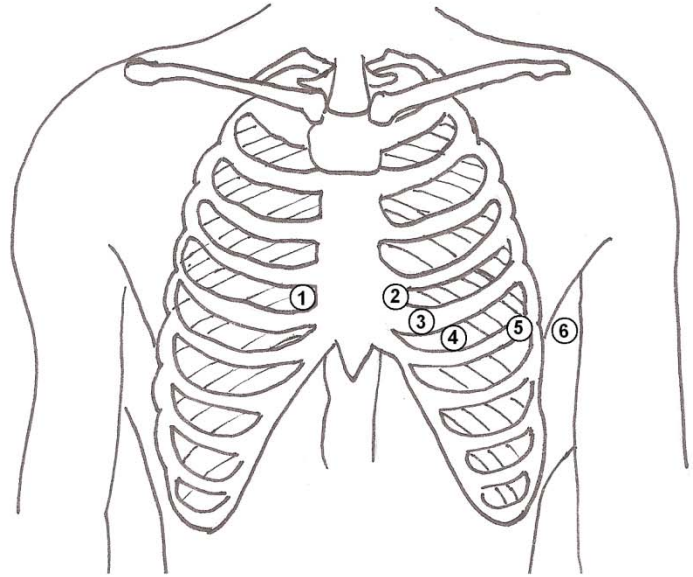
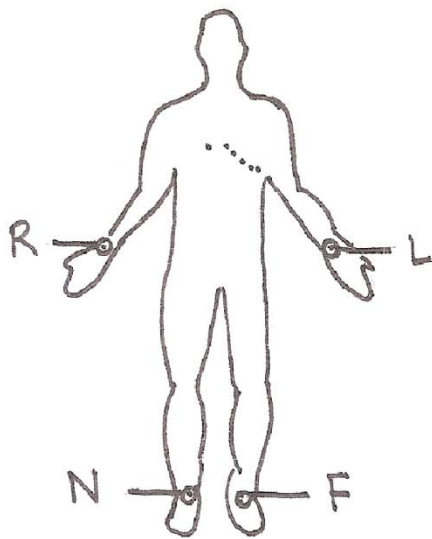
Identification and Diagnosis

ECG monitors should be calibrated about every six months, as part of preventative maintenance.

Procedure

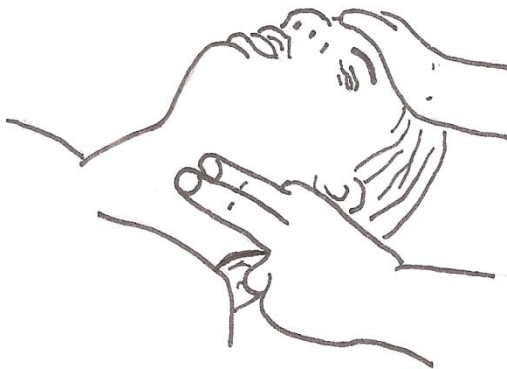
1. Turn the machine on. Depress the “1 millivolt” or “calibration” button.
 - a. For analog machines: Check that the stylus has deflected 10 small squares, similar to the picture at right.
 - b. For electric machines: Insure that a square wave form appears when the button is pressed. The wave should resemble the picture at right.
2. Find someone who will be your test patient.
3. Clean the test patient’s chest with an alcohol swab. Attach the electrodes and leads to the patient. Follow the ECG manual for electrode placement. Use the pictures below as a guide. The number of electrodes you will attach depends if the ECG is made for 3-lead (monitoring) or 12-lead (diagnostic) use. 3-lead ECG’s generally have four connections to the patient. 12-lead ECG’s have ten connections to the patient.





4. Check the ECG heart rate measurement

- Find the patient's pulse. You can find the pulse in two places. The radial pulse is on the inside of the wrist. The carotid pulse is between the windpipe and large muscle in the neck. Place two fingers on one of these areas. Press lightly until you feel a pulse. Do not use your thumb to take pulse.



- Using a watch to time 30 seconds, count the heartbeats. Multiply the number of heartbeats by 2. This is the patient's heart rate.
- Compare the calculated heart rate to the ECG's reading. The ECG reading should match within 2 beats per minute.

5. Check the alarms*

- Set the maximum heart rate by navigating through the machine's menus** to an option resembling "alarm limits." Set the maximum heart rate on the ECG machine below your patient's heart rate. The high heart rate (tachycardia) alarm should sound.

- Set the minimum rate alarm on the ECG machine above your patient's heart rate. The low heart rate (bradycardia) alarm should sound.
- Remove the wires from the patient. The electrode-off (or lead-off) alarm on the ECG machine should sound.

If the ECG has an apnea monitor, follow this procedure:

6. Attach the electrodes to the patient following the picture guide and the ECG manual.
7. Check the breathing rate
 - Count how many breaths are taken over 1 minute.
 - Compare the calculated breathing rate to the ECG machine's reading. The ECG machine's reading should be within 1 breath per minute.
8. Check the alarms
 - Set the maximum breathing rate on the ECG apnea monitor below your patient's breathing rate. The high breathing (hyperventilation) alarm should sound.
 - Set the minimum breathing rate on the ECG apnea monitor above your patient's breathing rate. The low breathing (hypoventilation) alarm should sound.
 - Instruct the patient to hold his breath. The apnea alarm should sound.

*Note: Not all ECG monitors have all alarms.

** Menus for different device models may differ.

Exercise

Calibrate your ECG with a partner. Your instructor must verify your work before you continue.

Preventative Maintenance and Calibration

Always calibrate every medical device before returning it to use.