جامعة المستقبل

AL-MUSTAQBAL
UNIVERSITY

College of Engineering and Engineering Technologies - Medical Device Technology Engineering

M.A.

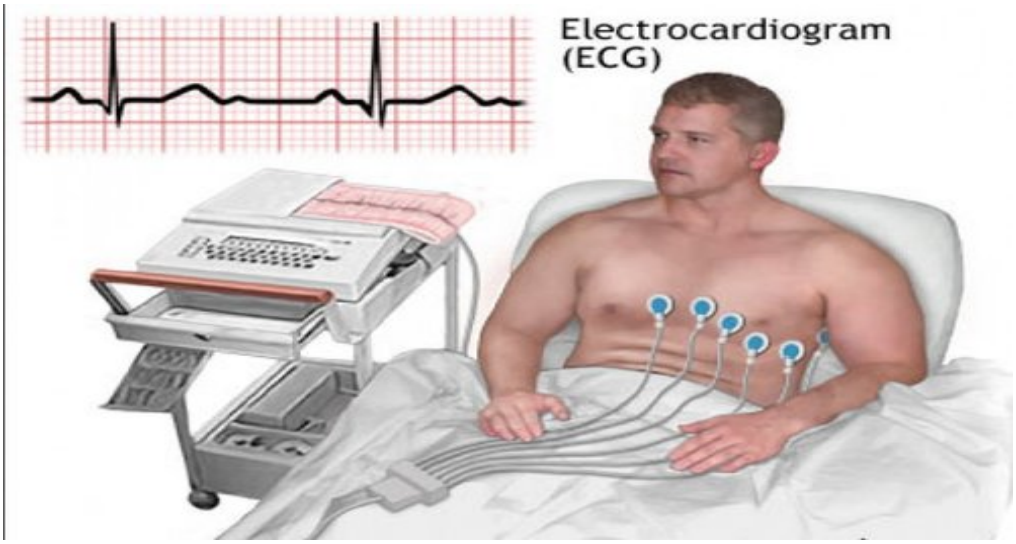
AHMED HELMI KADHIM

The third stage

First semester experiences

ECG, EMG, EEG & ERG

(Electrocardiography (ECG)



What is an electrocardiogram (ECG or EKG):

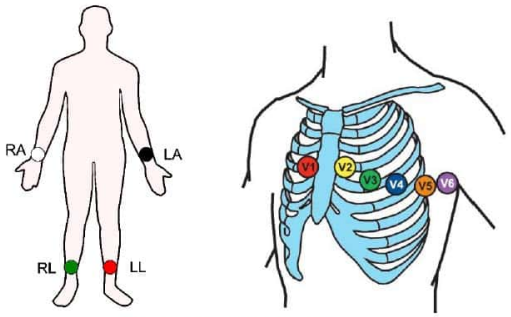
It is a quick test to check your heartbeat. It records the electrical signals in your heart. The test results can help diagnose heart attacks and irregular heartbeats, also known as arrhythmias.

Electrocardiograms may be used in medical clinics, hospitals, operating rooms, and ambulances. Some personal devices, such as smart watches, can perform a simple electrocardiogram. Ask your health care professional if this is an option for you.

How many electrodes does the ECG machine have:

_ First school / consists of 5 examination electrodes, 4 of them on the extremities of the body and 1 on the chest

_ Second school / consists of 10 examination electrodes, 4 of them on the extremities and 6 of them on the chest



RA – right forearm or wrist
LA – left forearm or wrist
LL – left lower leg, proximal to ankle
RL – right lower leg, proximal to ankle
V1 – 4-th intercostal space, right sternal edge
V2 – 4-th intercostal space, left sternal edge
V3 – midway between V2 and V4
V4 – 5-th intercostal space, mid-clavicular line
V5 – anterior axillary line in straight line with V4
V6 – mid-axillary line in straight line with V4 and V5

Figure 23: 12 leads resting ECG electrode placement

What is the reason for the device to turn off completely?

A - Electrical equipment malfunction B - Fuse failure C - On and off switch failure D - Board failure R - Cut in the connection cable

G - Lithium battery failure and the end of the device's life

What are the main parts of the ECG machine:

1_ Display screen

2- Keyboard

3- Printer

4- Electrodes

What are the malfunctions or problems that occur in the device:

Ecg device malfunctions

First, the ECG device consists of several parts

1.. The power supply unit or the electrical power unit that powers the device.. The control panel, screen, printer motor, thermal sensor, etc.

2.. The control unit, which is responsible for regulating the device, such as charging the battery, stopping charging, switching between using it and using the power directly, receiving input commands, and allowing other units to operate, such as pressing the power button, which allows the screen to operate and electricity and data to reach it....

3... The signal unit, which is the part responsible for receiving the heart signal, amplifying it, determining its parameters, and filtering it

4.. The screen unit, which is the display unit, and it has a board responsible for regulating electricity, receiving the signal, and then displaying it

5.. The printing unit, which has the thermal sensor or needle, which prints the data and signal by heating this element with a constant voltage, then there is a paper sensor and a motor to move the roller and the board responsible for regulating the unit

6.. The input unit or Signal connections: four sensors for the limbs and 6 for the chest, which transmit the weak heart signal when the skin resistance is reduced by the gel used.

One of the most common malfunctions is...

.. The device does not work and the power lamp does not light up.. The power supply unit must be checked. If there is no voltage on the output, the problem is in the board of this unit, either fuses or there is an electrical short in the output transistor or the input bridge or one of the circuit diodes.

... The device does not work with the power lamp lit and the screen works at first for startup and then turns off.. The problem is in the weakness of the power supply circuit voltage value and it is checked with an external source with the same voltage and ampere instead. If the device works, the output transistor or its diodes are checked for the power unit. If there is tampering with the voltage, i.e. an increase or decrease, some capacitors may be faulty. There is something important in this problem, which is the failure of the optocouple IC, often called IC 817.

... The device works, but there is a problem with the signal. .. Check the settings then the 50 or 60 Hz power inlet filter, try changing it to the best frequency that gives a good signal.. If the problem is not solved, use all the filters, the notch and the high, etc.. If the signal improves, cancel the filters, filter by filter, cancel one and check the signal. If the signal worsens, cancel one of them, for example, the EMG muscle filter, then the problem is in the looseness of the connections or the patient's movement or the uncleanliness of the electrodes. If the problem is due to canceling other filters, there may be an external source of interference such as an X-ray or ultrasound device nearby that must be removed.. Here is something important in some Chinese heart devices, including the power unit next to the signal unit, and there is no cover on any of them or an insulator, so interference and interference occur and may lead to the failure of the signal unit. The solution is either to isolate and cover the signal board and isolate it from the power unit or move the power unit outside the device..

... The device lights up and all the panel lights light up. Make sure of them when disassembling the device and then turning it on, then The screen does not work.. The problem is in the screen itself or its backlight, or it may be in the screen panel and the screen opening transistors.. The screen opening parts may be in the control panel and not in the screen panel..

... The device is working and the signal is good, but it does not print with the paper coming out.. The problem is in the thermal head. The voltage may not be reaching it due to a malfunction in the responsible parts. If the head voltage is present, the problem is in the head itself.

.. The device is working and the signal appears good, but it does not print or the paper comes out.. Check the print button if it is fine. Check the paper sensor.. Fine.. The paper.. Is present and matches the device.. Check the roller motor voltage or the roller itself.. Is present and fine.. Check the thermal head voltage.. Is present.. The thermal head

Questions about the ECG device :

1 - Why does the ECG device printer not draw the desired test wave?

Answer: There are many reasons, including - Dirty test electrodes. Cuts in the electrodes. Malfunction in the device printer. Failure to connect the black terminal electrode and other reasons

2 - Why does the drawing line appear light in color?

Answer: The problem is in the printer's thermal resistance sensor, as dust has formed on it

3 - Why does the word (No paper) appear despite its presence?

Answer: The problem is in the paper sensor, which is on the opposite side of the paper winding lever, as it is dirty and can be easily wiped

4 - What is the basis of the device's printer operation - that is, how does it work?

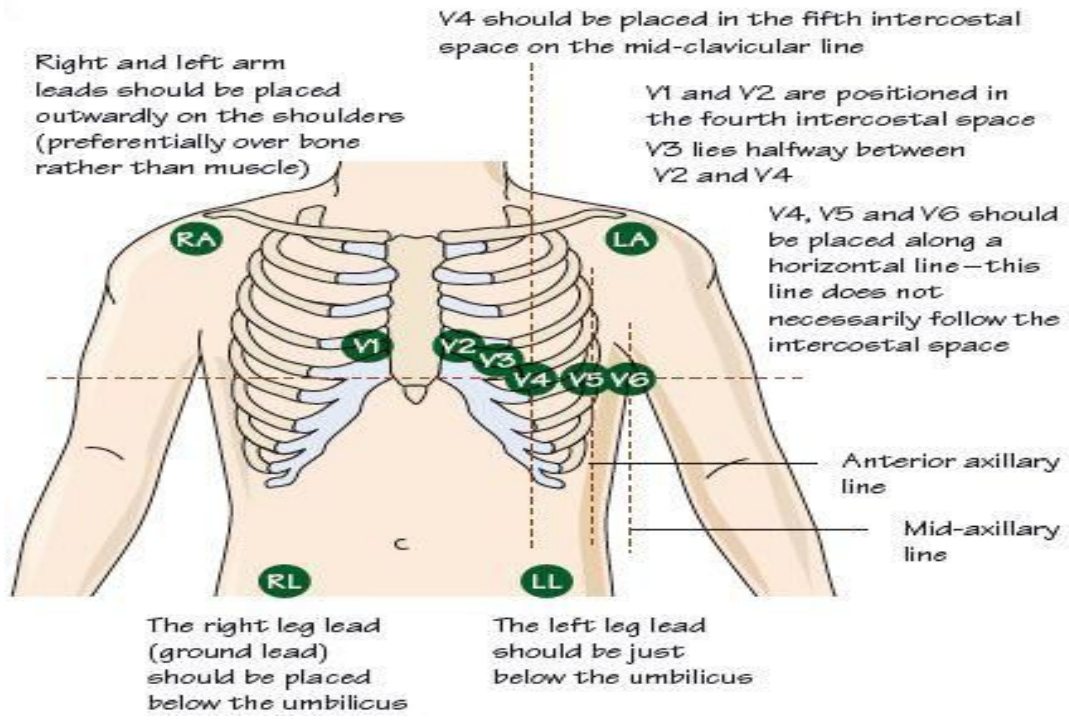
Answer: Through a thermal resistance in the form of a needle that works by consuming a certain amount of electrical energy in order to raise the temperature of the thermal needle in order to draw on the paper

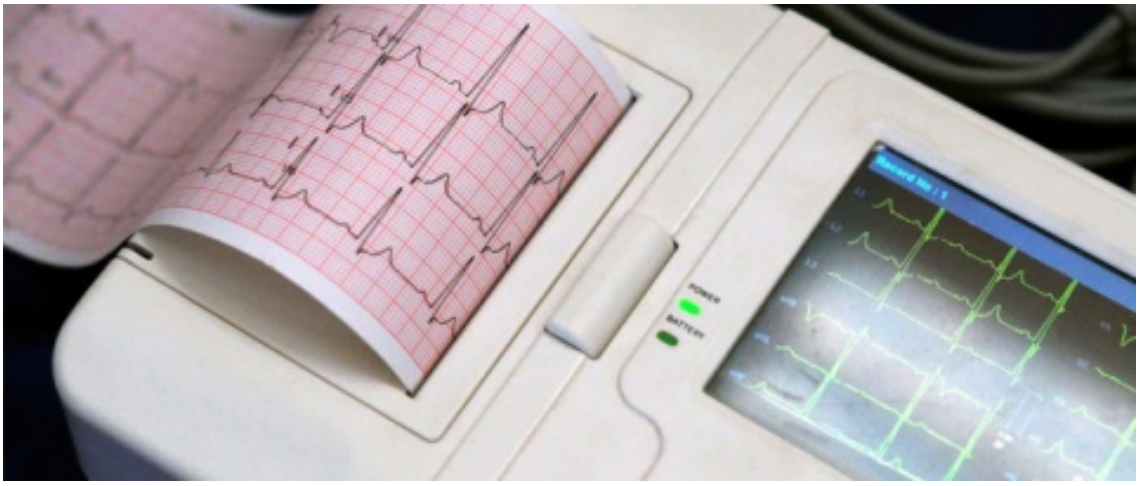
5 - What is the reason for the device turning off completely?

A - Equipment electrical fault B - Fuse failure C - On/Off switch failure D - Board failure

6 - What is the reason for the electrocardiogram reading to appear distorted, incorrect or illogical?

A - Disconnection in the electrodes B - Accumulation of dirt on the electrodes C - Incorrect electrode connection D - All of the above





END OF THE FIRST LECTURE

I WISH YOU GOOD LUCK AND SUCCESS