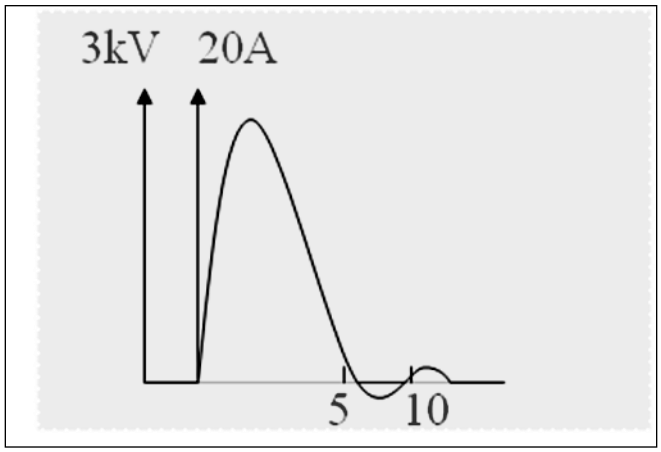
Cardiac Defibrillators

Defibrillation waveforms:

1) The lown waveform: shows the voltage and the current applied to the patient's chest plotted against time.

The current will rise very rapidly to about 20A, under the influence of slightly less than 3KV.the waveform then decays back to zero within 5msec duration. The charge delivered to the patient is stored in a capacitor and is produced by a high voltage DC power supply. The operator can set the charge level using the set energy knob on front panel. This knob controls the DC voltage produced by the high voltage power supply, so can set the maximum charge on the capacitor.



2) mono pulse waveform: this wave is created by a circuit similar to the circuit of lown waveform but without inductor to create the negative second pulse. Consequently, the wave form decays to zero in the exponential manner expected of an R-C network.

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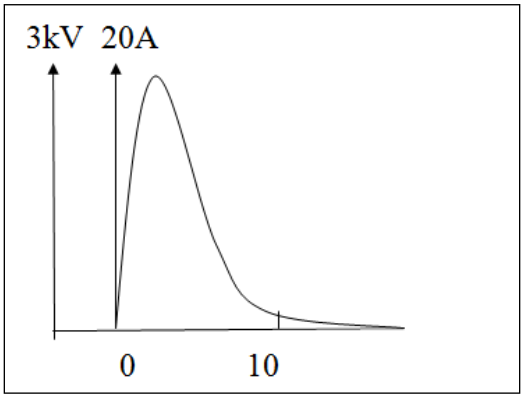
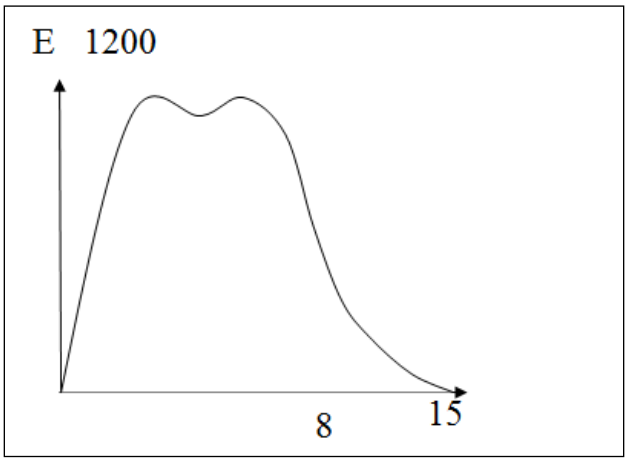
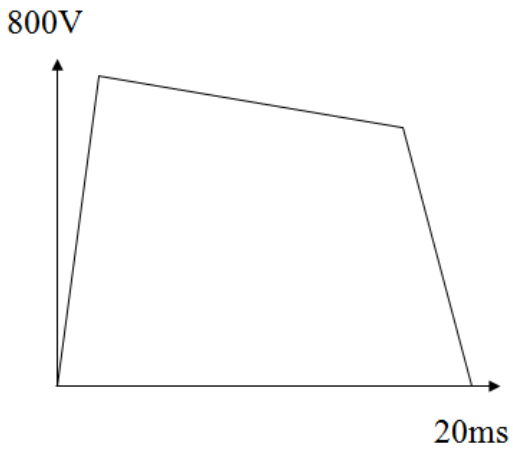


3) tapered delay: this waveform differs from the two previous pulses in that it uses a lower amplitude and longer duration to achieve the energy level. The energy transferred is proportional to the area under the square of the curve. The double-humped waveform characteristic of tapered delay machines is achieved by placing two L-C section such as L/C in cascade with each other.



4) trapezoidal waveform:
is another low voltage-long duration shape. The initial output potential is about 800V, which drops continuously for about 20msec until it reaches 500V.



Electrodes of defibrillator:

The electrodes for external defibrillations are usually metal discs about 3-5 cm in diameters and attached to highly insulated handles, for internal defibrillation large spoon shaped electrodes are used. Some of the external electrode contains safety switches inside the housings and the capacitor is discharged only when the electrodes are making a good and firm contact with the chest of the patient.

Electrode gel is usually used to reduce contact impedance.

Pre-gelled and self adhesive electrodes have been introduced to meet the requirements of good and firm contact.

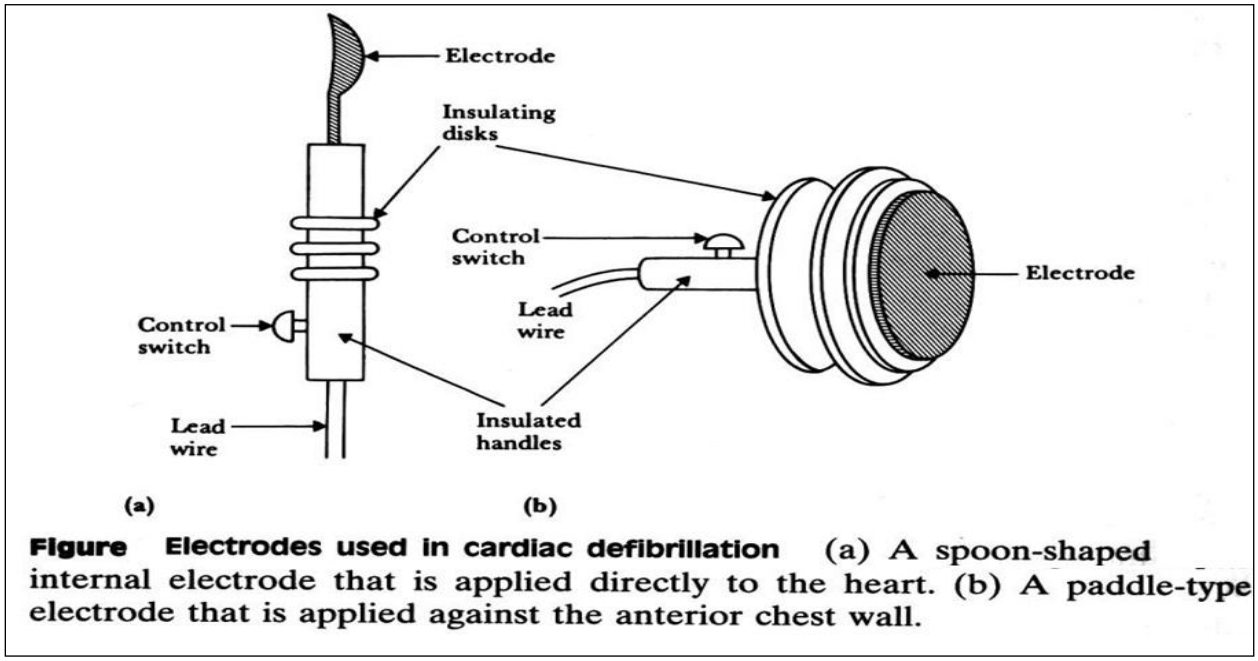


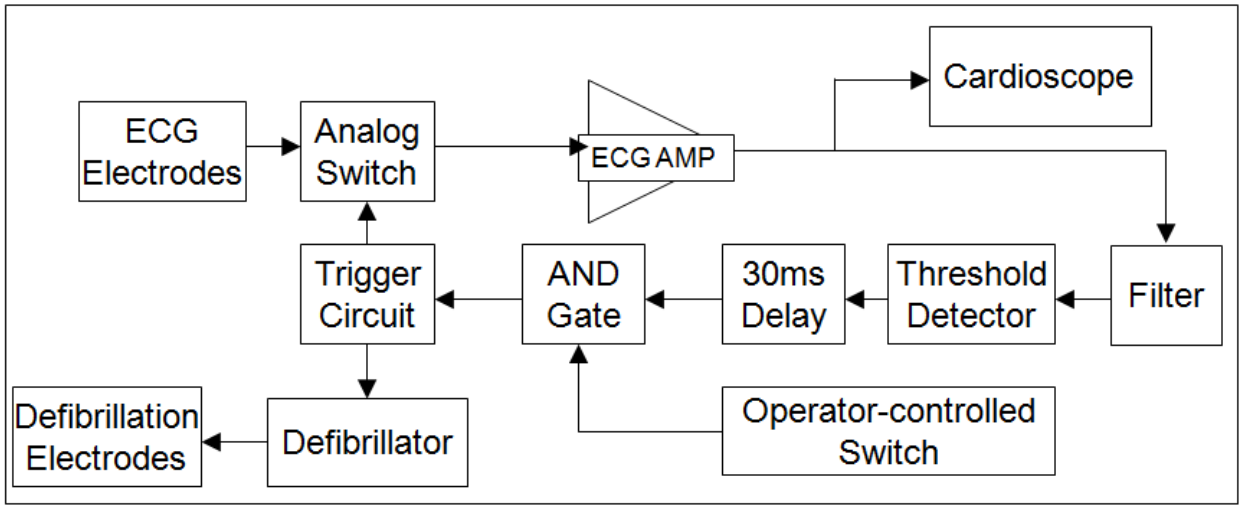
Figure Electrodes used in cardiac defibrillation (a) A spoon-shaped internal electrode that is applied directly to the heart. (b) A paddle-type electrode that is applied against the anterior chest wall.

Cardioversion:

In certain type of arrhythmia (atrial fibrillation) the patients ventricles maintain their ability to pump blood, evidence by R-wave, these arrhythmias are also corrected by electrical shock to the heart, but it is necessary to avoid delivering this shock during T-wave.

The shock used to correct the problem may actually create much more serious arrhythmia such as ventricular fibrillation.

The shock is timed to occur 30 ms after the R- wave peak to prevent ventricles fibrillation to occur. The machine equipped with synchronizer cct. Is called a cardioverter.



The block diagram of the cardioverter

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