

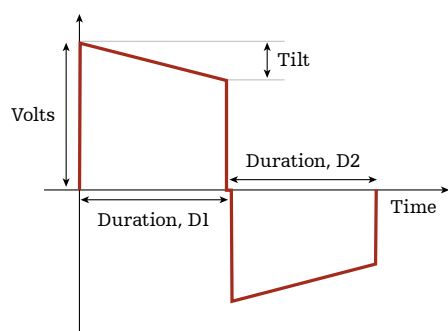
## SCOPE™ Biphasic escalating waveform

### History

Early external defibrillators used selectable energy levels that were set by the attending physician. The physician not only needed to estimate impedance based on a specific patient, but also needed to increase the energy level if defibrillation was not initially successful. In addition, the monophasic waveforms used energy levels up to 360 Joules to defibrillate effectively.

### Biphasic waveforms

Biphasic waveforms, which were initially developed for use in implantable defibrillators, have become the standard in public access defibrillators. Importantly, many studies have shown that biphasic waveforms defibrillate successfully at lower energies because biphasic waveform technology allows the waveform to be adapted for different patient impedances. For any particular energy level there are three primary variables for the wave shape: voltage, tilt, and the duration of each phase.



Manufacturers of public access defibrillators have adopted different strategies for biphasic waveforms, adjusting one or more of the main variables to compensate for patient impedance. The various approaches are shown in the following table.

| Waveform                          | D1       | D2       | Voltage  | Tilt     |
|-----------------------------------|----------|----------|----------|----------|
| HeartSine SCOPE                   | Variable | Variable | Variable | Variable |
| Cardiac Science STAR <sup>1</sup> | Variable | Fixed    | Variable | Variable |
| LIFEPAK <sup>2</sup>              | Variable | Variable | Variable | Variable |
| Philips SMART <sup>3</sup>        | Variable | Variable | Fixed    | Variable |
| ZOLL <sup>4</sup>                 | Fixed    | Fixed    | Variable | n/a      |

### SCOPE waveform

SCOPE (Self Compensating Output Pulse Envelope) is HeartSine's proprietary low-energy, biphasic waveform. Unlike the technology used by other manufacturers, the HeartSine SCOPE waveform adjusts all three variables for all impedances in the operating range and uses an escalating energy protocol to optimize the efficacy of the HeartSine samaritan PAD.

Because biphasic waveforms are adapted for varying patient impedance, the range of patient impedance over which the device operates is significant. As shown in the table below, the SCOPE waveform can deliver a shock over a wide impedance range (20-230 ohms) without a significant loss of energy—another advantage of the HeartSine SCOPE technology.

| Waveform                          | Min Impedance | Max Impedance |
|-----------------------------------|---------------|---------------|
| HeartSine SCOPE                   | 20 Ohms       | 230 Ohms      |
| Cardiac Science STAR <sup>1</sup> | 25 Ohms       | 180 Ohms      |
| LIFEPAK <sup>2</sup>              | 10 Ohms       | 300 Ohms      |
| Philips SMART <sup>3</sup>        | 25 Ohms       | 180 Ohms      |
| ZOLL <sup>4</sup>                 | 0 Ohms        | 300 Ohms*     |

\*Delivered energy reduces after 175 ohms.<sup>5</sup>

Please note, with HeartSine SCOPE technology, if the patient impedance is below 20 ohms or in excess of the maximum 230 ohms, the device will NOT deliver a shock.

## References

1. *User's Guide, Cardiac Science Powerheart Automated External Defibrillator*. 70-01704-01 B.
2. *LIFEPAK CR2 Defibrillator with LIFELINKcentral AED Program Manager. Operating Instructions*. 3322738-023.
3. *HeartStart Defibrillator. OWNER'S MANUAL*. M5066A Edition 11.
4. *ZOLL AED Plus. Administrator's Guide*. 9650-0301-01 Rev. V.
5. Kettea F, Locatelli A, Bozzolaa M, et al. Electrical features of eighteen automated external defibrillators: A systematic evaluation. *Resuscitation*. 2013;84:1596–1603.

All claims valid as of April 2021.

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## Emergency Care Public Access

AED users should be trained in CPR and in the use of the AED.

Although not everyone can be saved, studies show that early defibrillation can dramatically improve survival rates. AEDs are indicated for use on adults and children. AEDs may be used on children weighing less than 25 kg (55 lb) but some models require separate defibrillation electrodes.

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Pad-Pak and Pediatric Pak are CE marked (class IIB – 0123) in accordance with applicable directives.

UL Classified. See complete marking on product. 



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