

## CPR Rate Advisor™ Revolutionary ICG-Based Technology

### Overview

**CPR Rate Advisor™ for the HeartSine® samaritan® PAD 450P (SAM 450P) automated external defibrillator provides real-time visual and audible feedback to the rescuer on the rate of compressions during a sudden cardiac arrest (SCA) resuscitation.**

Because Cardiopulmonary Resuscitation, commonly known as CPR, is crucial to deliver oxygenated blood to the body's vital organs, CPR Rate Advisor helps the rescuer perform CPR at an optimal rate in line with the AHA and ERC guidelines.

To measure the rate of compressions, other AEDs require a third sensor (or puck) to be placed on the patient's chest. With its revolutionary technology, HeartSine's proprietary CPR Rate Advisor via the defibrillator electrodes determines the rate of CPR being applied, without the addition of accelerometers (or pucks) commonly used in other AEDs.

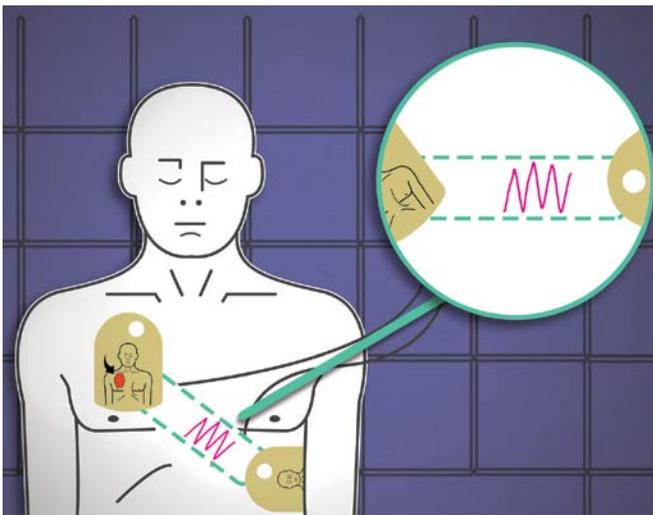


Figure 1. HeartSine's defibrillator detects changes in patient impedance.

### How CPR Rate Advisor Works

When a patient collapses and a rescuer performs CPR, the compressions applied by the rescuer cause the patient's chest to change shape and result in a change to the patient's ICG (impedance cardiogram) waveform. CPR Rate Advisor captures the change in the ICG waveform which it uses to count the number of compressions a rescuer administers. By counting deflections in the ICG waveform, CPR Rate Advisor determines the compression rate and advises the

rescuer to "Push faster" if the compression per minute (CPM) rate is below that recommended by the AHA guidelines.

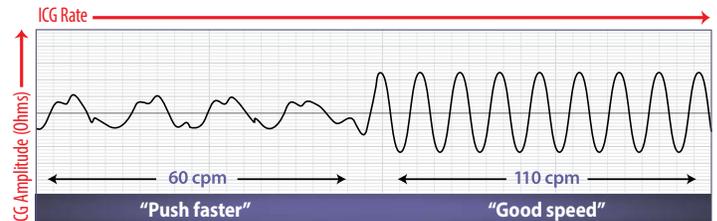


Figure 2. Rescuer's CPR compression rate is too slow, as determined by the low number of deflections detected by the ICG waveform. The SAM 450P will issue the audible prompt "Push faster" until the correct compression rate is achieved.

Likewise, if the rescuer's CPM rate is greater than that recommended by the AHA guidelines, CPR Rate Advisor will tell the rescuer to "Push slower".

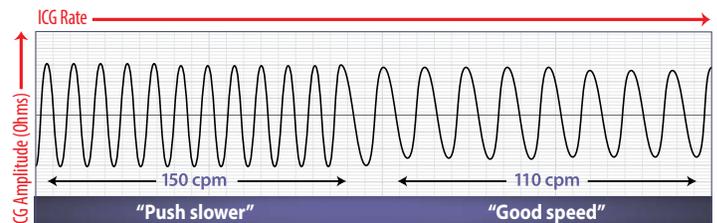


Figure 3. Rescuer's CPR compression rate is too fast, as determined from the high number of deflections detected by the ICG waveform. The SAM 450P issues the audible prompt "Push slower" until the correct compression rate is achieved.

The AHA also recognizes the need to keep interruptions to a minimum prior to and during CPR. To do this, the SAM 450P uses the signals detected through the electrode pads to prompt the rescuer to "Begin CPR" if not already doing this. The SAM 450P also will detect when compressions have stalled between shock decision cycles and give feedback to the rescuer to ensure that interruptions are minimized.

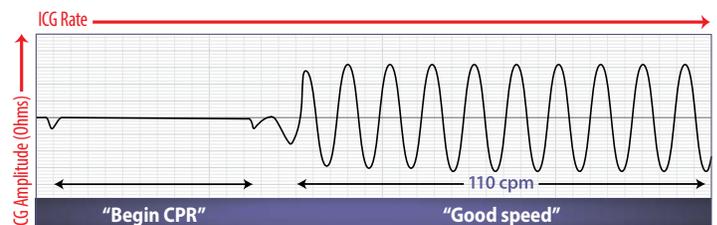
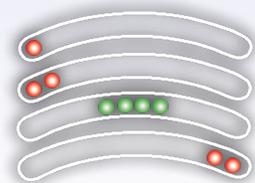
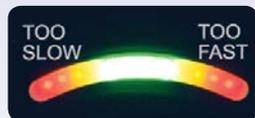


Figure 4. No movement detected in the ICG waveform. In an effort to maximize CPR compression time by the rescuer, the SAM 450P will issue the audible prompt "Begin CPR" repeatedly until CPR is started.

This real-time feedback is important as even though most trained rescuers understand the need to push hard and push fast, rescuer fatigue may set in after as little as one minute, resulting in slower compression rates. The SAM 450P provides compression rate feedback to the rescuer via both visual indicators on the SAM 450P user interface and audible voice prompts.



No CPR being performed/“Begin CPR”

“Push faster”

“Good speed”

“Push slower”

Figure 5. Visual indicators and audible feedback tell the rescuer if the rate of CPR is in line with the AHA guidelines.

## Improved CPR Rate Efficacy

Usability study results in untrained users showed that the number of users achieving good compression speed was higher with CPR Rate Advisor when compared to a device without feedback, without compromising compression depth. This demonstrates the usability of the SAM 450P in an untrained user environment.\*

Studies have shown that effectiveness of CPR is most likely limited by poor performance in any of its components and that inadequate rate, even in the presence of sufficient depth and technique, likely reduces the effectiveness of CPR compressions<sup>1</sup>. Evidence suggests that even healthcare professionals do not always achieve the correct CPR compression rates according to AHA guidelines<sup>1,2</sup>, and that chest

compression rate is associated with the return of spontaneous circulation (ROSC)<sup>3</sup>.

Effective CPR, provided alone or in conjunction with a lifesaving shock, can dramatically increase the chance of survival. CPR Rate Advisor, in conjunction with the metronome, is intended to help rescuers perform CPR at an optimum rate by monitoring their real-time CPR performance and helping to guide them toward the correct rate of compressions.

Integrated CPR Rate Advisor helps improve compliance with CPR rate and CPR fraction guidelines while instilling more confidence in the rescuer. And because CPR Rate Advisor is integrated within an industry-leading HeartSine defibrillator, it can deliver a shock if needed.

By accompanying the rescuer right through the rescue process, helping to ensure CPR is continuously performed at an effective rate and delivering a shock when necessary, the samaritan PAD 450P with integrated CPR Rate Advisor may help improve CPR efficacy.

\* Accepted for presentation at the Emergency Cardiovascular Care Update (ECCU) 2015 Conference

## References

1. Abella, B. et. al., “Chest Compression Rates During Cardiopulmonary Resuscitation are Suboptimal,” *Circulation*, 2005; 111:428-434.
2. Milander MM, Hiscok PS, Sanders AB. et al. Chest compression and ventilation rates during cardiopulmonary resuscitation: the effects of audible tone guidance. *Acad Emerg Med*. 1995;2:708-713
3. Idris, A. et. al., “Relationship Between Chest Compression Rates and Outcomes from Cardiac Arrest,” *Circulation*, 2012; 125; 3004-3012.

**EMEA/APAC**  
HeartSine Technologies, Ltd.  
203 Airport Road West  
Belfast, Northern Ireland  
BT3 9ED  
Tel: +44 28 9093 9400  
Fax: +44 28 9093 9401  
info@heartsine.com



**U.S./Americas**  
HeartSine Technologies, Inc.  
121 Friends Lane, Suite 400  
Newtown, PA 18940  
Toll Free: (866) 478 7463  
Tel: +1 215 860 8100  
Fax: +1 215 860 8192  
info@heartsine.com



UL Classified. See complete marking on product.

**CAUTION:** U.S. Federal law restricts this device to sale by or on the order of a licensed practitioner.

© 2015 HeartSine Technologies, Inc. All rights reserved. H009-020-008-1

Lifesaving, Pure and Simple



www.heartsine.com

