

# Synthesized 18-lead ECG: A New Technology for More Informative ECG Exam

## What is Synthesized 18-lead ECG?

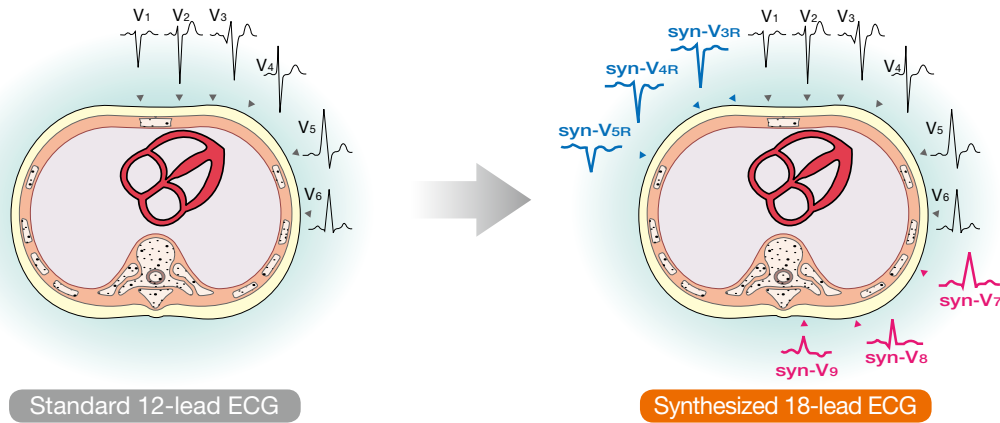
The most common ECG exam is the standard 12-lead ECG. It is simple to measure, has low burden on the body, and observing the heart from these 12 directions provides a lot of information which has a wide range of clinical applications.

However, some areas, especially pathological change in the right ventricle and the posterior wall cannot be observed from the 12-lead ECG.

In order to actually measure the right chest (V3R, V4R, V5R) and back (V7, V8, V9) areas, it is necessary to use different electrode positions than the standard 12-lead ECG. In particular, electrodes must also be attached to the patient's back so that normal suction cup electrodes cannot be used. Also, the patient must be turned over in some cases and in an emergency it is often difficult to use back electrodes. This complicates the exam procedure.

Synthesized 18-lead ECG uses the 12-lead ECG waveforms to mathematically derive the waveforms of the right chest leads (V3R, V4R, V5R) and back leads (V7, V8, V9).

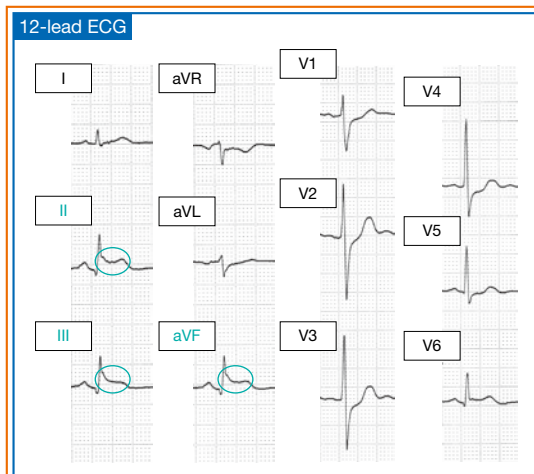
The measurement procedure is the same as the standard 12-lead ECG but more information can be obtained. 18-lead synthesized ECG is expected to be useful in detecting right side and posterior infarction.



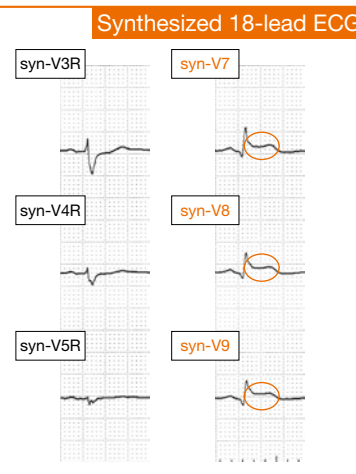
Standard 12-lead ECG

Synthesized 18-lead ECG

Synthesized right side leads (V3R – V5R) and synthesized back leads (V7 – V9) are added



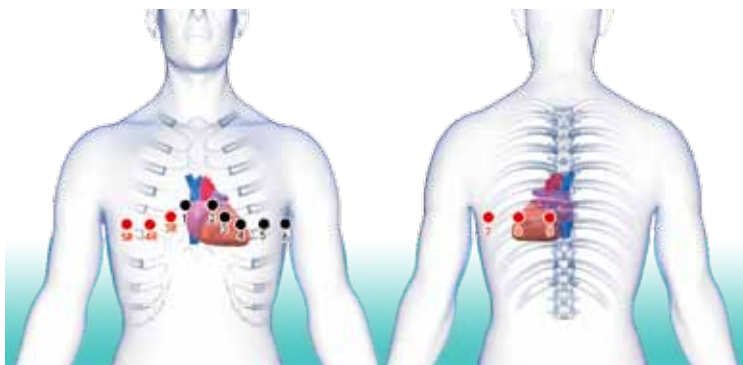
Inferior wall infarction



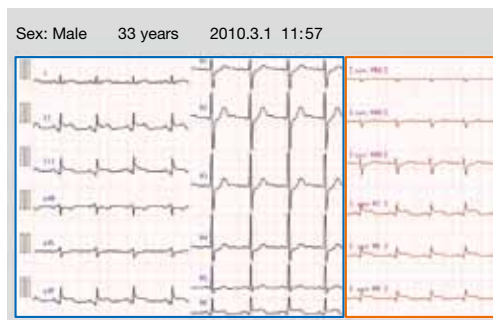
Posterior wall infarction

## Principle of Synthesized Waveforms

Instantaneous cardioelectric vectors are continuously measured from the standard 12-lead ECG data and ECG of the right leads (V3R, V4R, V5R) and back leads (V7, V8, V9) is synthesized from this data.



Instantaneous cardioelectric vectors are continuously calculated from actual leads.

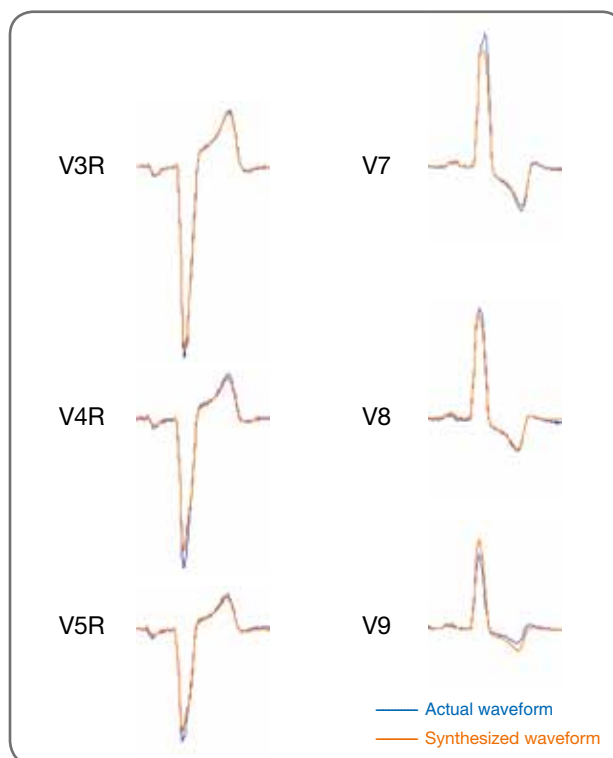


Actual waveform

Synthesized waveform

Right leads (V3R - V5R) and back leads (V7 - V9) are synthesized from the cardioelectric vector data.

The following example shows actually measured waveforms and synthesized waveforms. Other data also has good correlation with actually measured ECG. This suggests that we can obtain useful information which corresponds to the condition of the heart.



Actual waveform

Synthesized waveform

- This method looks for intracardiac vectors which are based on the standard 12-lead ECG data and derives the waveforms for each area. Accurate electrode positions are necessary to obtain accurate synthesized lead waveforms.
- The synthesized waveforms are derived from calculations and may vary from the actual waveforms. (More detailed information is available.)