Evaluating Lead EGM Signals with COGNIS® and TELIGEN® Devices

SUMMARY

Real-time or stored electrograms (EGMs) may be used to assist with patient assessment, device programming, and evaluate lead system integrity. COGNIS® and TELIGEN® devices offer a variety of programmer tools for evaluating EGMs.

This article describes:
- The programmer tools available for evaluating EGMs.
- How to use the tools to facilitate patient assessment and device programming.

CRM PRODUCTS REFERENCED

The following are trademarks of Cardiac Pacemakers Inc., a Boston Scientific company:

COGNIS and TELIGEN.

Products referenced herein may not be approved in all geographies. For comprehensive information on device operation, reference the appropriate product labeling.

CRT-D: Cardiac Resynchronization Therapy Defibrillator
ICD: Implantable Cardioverter Defibrillator

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Display and analysis of real-time and stored electrograms (EGMs) on a ZOOM® LATITUDE® programmer can be a valuable tool during an implant procedure or a post-implant follow-up. EGMs can be used to assess sensing and capture, and to evaluate lead system integrity. Evaluation of all active leads can be performed to assist with patient assessment and device programming, as well as identify possible lead or lead connection issues. The EGM evaluation tools available with COGNIS® and TELIGEN® devices facilitate review of device and patient information, including:

- Ability to measure amplitude of cardiac signals
- Ability to measure time between cardiac signals
- Selectable gain for each channel

COGNIS and TELIGEN instructions for use recommend evaluation of pace/sense and defibrillation lead signals by viewing real-time EGMs and markers, following connection of leads and removal from Storage mode during an implant procedure.

When evaluating lead signals:

- The signals from the implanted leads should be continuous and without artifact, similar to a surface ECG.

- A discontinuous signal may indicate a poor lead connection or damaged lead that may necessitate lead replacement.

- Inadequate signals may result in failure of the device system to properly detect an arrhythmia, inability to deliver programmed therapy, or unnecessary delivery of therapy.

Note: *EGM evaluation (both real-time and stored) can also be a useful tool for post-implant, in-clinic patient follow-up visits.*

The ZOOM LATITUDE programmer provides a variety of tools for assisting clinicians with evaluation of EGMs. In addition to the tools described in the following section, both real-time and stored EGMs can be printed for further evaluation and storage.

Real-time EGMs (Figure 1)

- Select desired real-time tracings. ❶ Surface options: Lead I, II, III, aVR, aVL, aVF, or V. EGM options: A, RV, LV, or Shock.
- To enlarge all four tracings, select the Details button. ❷
- Trace selection—If desired, select different leads for the tracings. ❸
- Trace speed—Adjust trace speed as needed (0, 25, or 50 mm/sec). As the speed is increased, the time/horizontal scale is expanded. ❹

  NOTE: Adjusting the Trace speed is for on-screen viewing only; use the printer/recorder paper speed keys on the programmer to adjust the speed of the EGM print-out.

- Gain—Adjust the amplitude/vertical scale as needed (AUTO, 1, 2, 5, 10, or 20 mm/mV) for each channel using the Gain button. ❺ As the gain is increased, the amplitude of the signal is enlarged.
- Show Device Markers—Select this button to enable annotated markers on the running EGM. ❻
- Enable Surface Filter—Select this button to minimize extraneous noise on the surface ECG. ❻
- Display Pacing Spikes—Select this button to show detected pacing spikes, annotated by a marker on the surface ECG. ❻
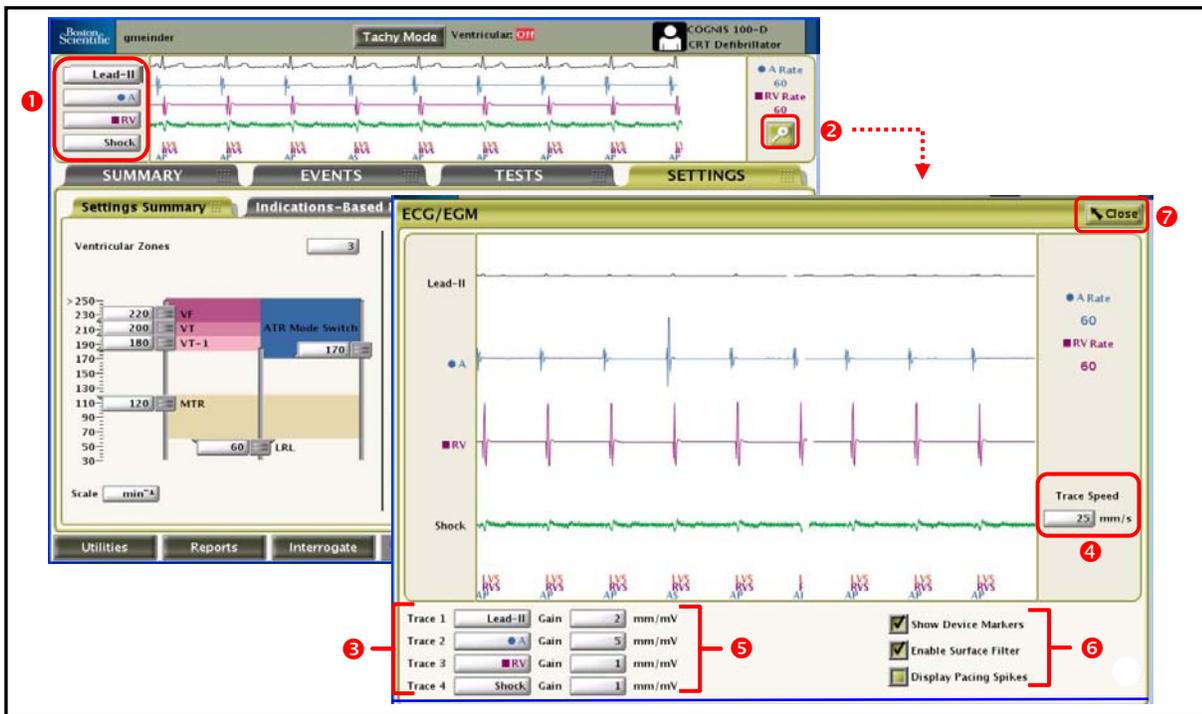- Select the Close button ❼ to close the window when done evaluating the signals.

Figure 1. Real-time EGMs.

Stored EGMs (Figure 2)

To obtain the EGM for an episode stored in the Arrhythmia Logbook, select a specific episode ❶ and then the Details button. The Stored Event will be displayed; to view the stored EGM, select the EGM tab.

- Large Scale View Selector—Use the slider at the top of the EGM box to scroll through the entire episode and select a particular segment of interest, which will be enlarged below. ❷
- Trace speed—Adjust trace speed as needed (10, 25, 50, 100 mm/s) to view the enlarged EGM segment. As the speed is increased, the time/horizontal scale is expanded. ❸

  NOTE: Adjusting the Trace speed is for on-screen viewing only; the print speed of a stored EGM defaults to 25mm/s.

- Caliper—An electronic caliper (slider bar) is available ❹ to measure the distance/time between signals as well as measure the amplitude of signals.
  - The distance between signals can be measured by moving each caliper to the desired points on the EGM. The time (in milliseconds) between the two calipers will be displayed.
  - The amplitude of the signal can be measured by moving the left-hand caliper over the peak of the desired signal. The value (in millivolts) of the signal will be displayed on the left side of the EGM. ❺ The signal is measured from baseline to peak, either positive or negative.
- Gain—Adjust the amplitude/vertical scale as needed (0.2, 0.5, 1, 2, 5) for each channel using the up/down arrow buttons. ❻ As the gain is increased, the amplitude of the signal is enlarged.
- Print Event/Save to Disk—The selected EGM can either be printed or saved to disk by selecting the appropriate button in the bottom right corner of the screen. ❼

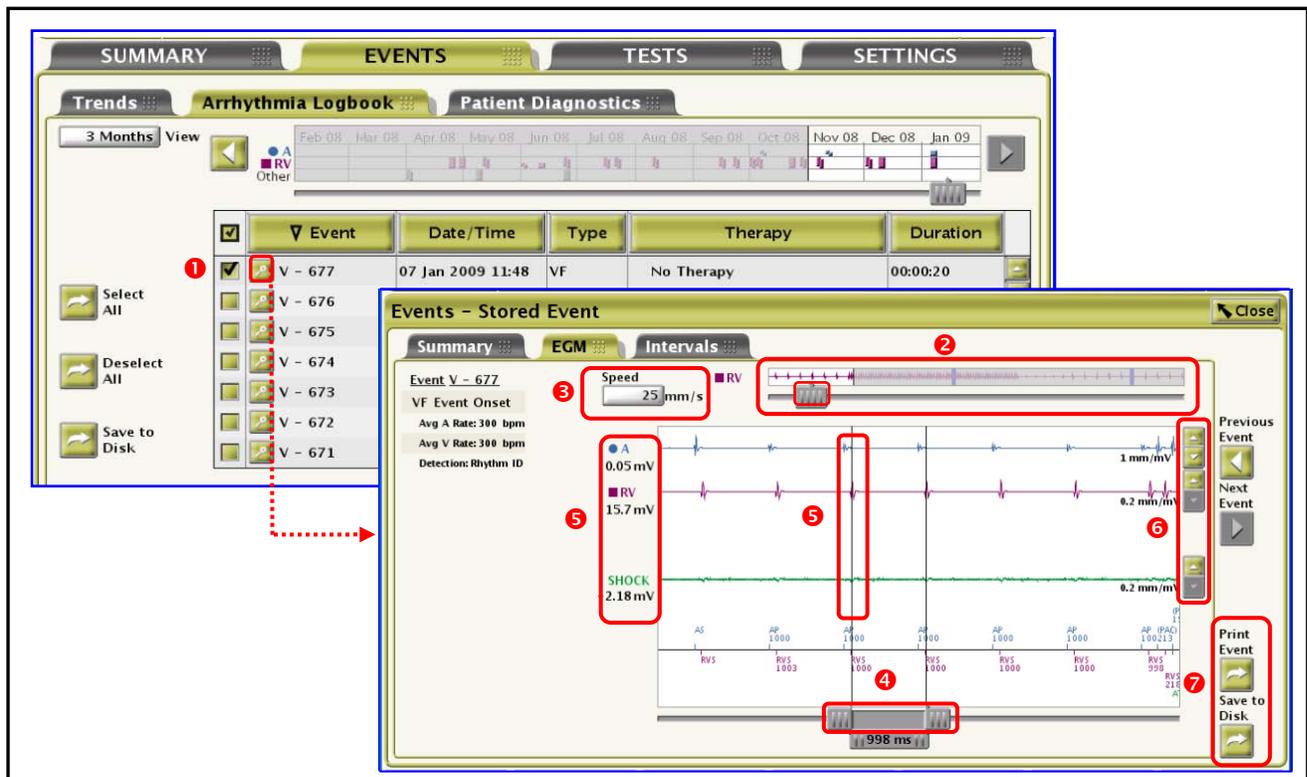*Note: Any changes made while viewing one event, will not be saved for viewing a different event.*

Figure 2. Stored EGMs.

Examples Using the EGM Evaluation Tools for Patient Assessment

Evaluating lead signals with the EGM tools provides clinicians with an opportunity for patient assessment. The following are examples of how to use the EGM evaluation tools to troubleshoot artifact/noise and assist with device programming:

Use of the Electronic Calipers to Measure Cardiac Signal Amplitude

Measuring the amplitude of EGM signals in Stored Episodes may be useful to help determine the appropriate sensitivity setting for each channel. The example shown in Figure 3 depicts a stored Induction event. Signals of interest on the RV rate/sense channel of the EGM can be measured and considered when making adjustments to the RV sensitivity setting.
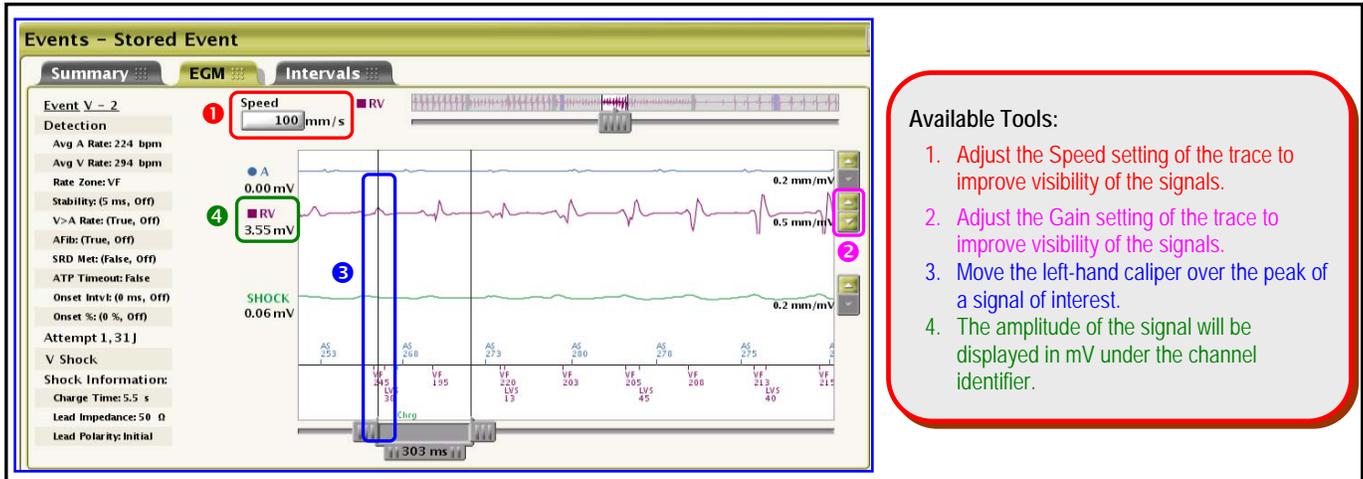

Figure 3. EGM from a stored Induction episode.

Use of the Selectable Gain setting to Better View and Evaluate Cardiac Signals on Surface ECG and Real-time EGMs

The user can adjust the Gain setting ❶ on a surface ECG to view and evaluate cardiac signals. The most effective Gain setting will vary for different signals. Three gain settings of the same rhythm are depicted in Figure 4.
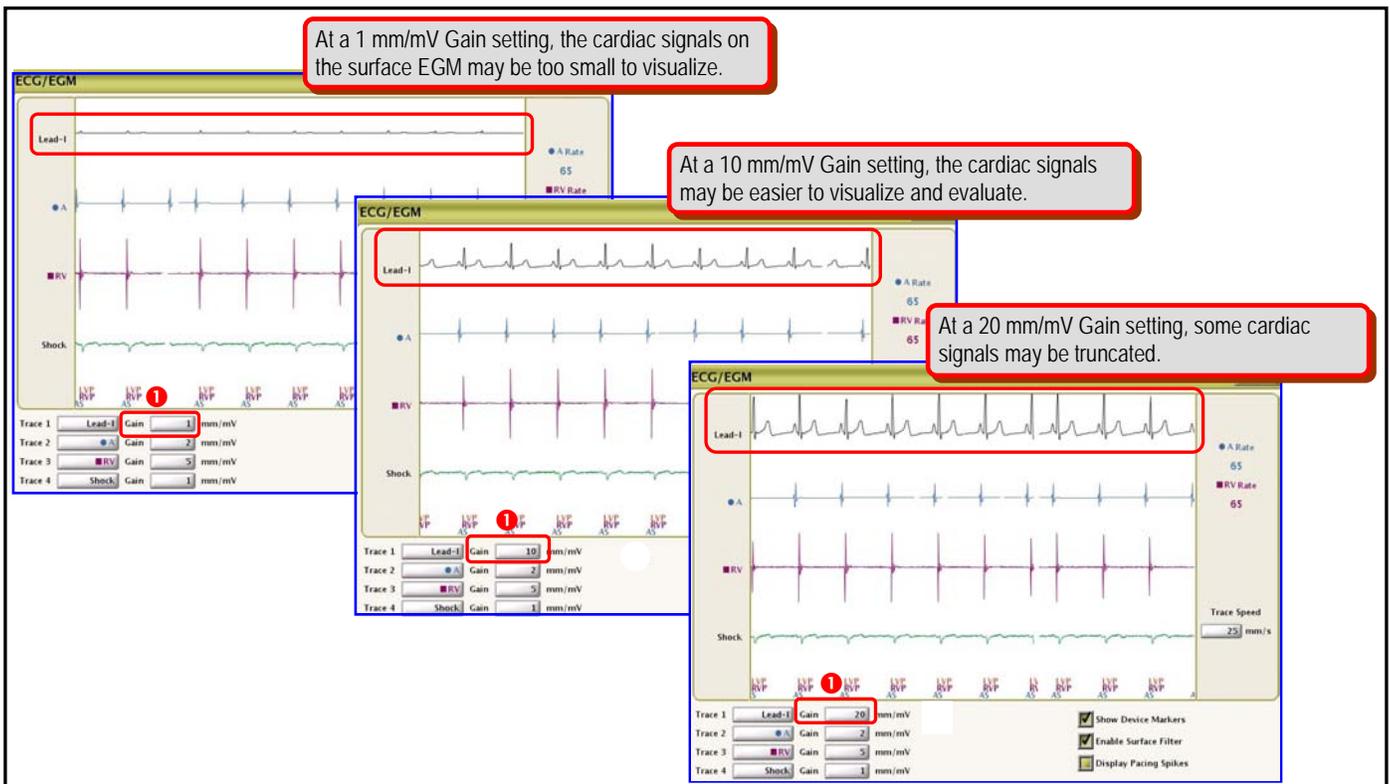

Figure 4. Real-time EGMs depicting various Gain settings.

Use of the Electronic Calipers to Measure Timing Between Cardiac Signals

Measuring the V-A timing (paced ventricular event to retrograde atrial event) from an EGM stored during a pacemaker mediated tachycardia (PMT) episode can be helpful in determining a post-ventricular atrial refractory period (PVARP).
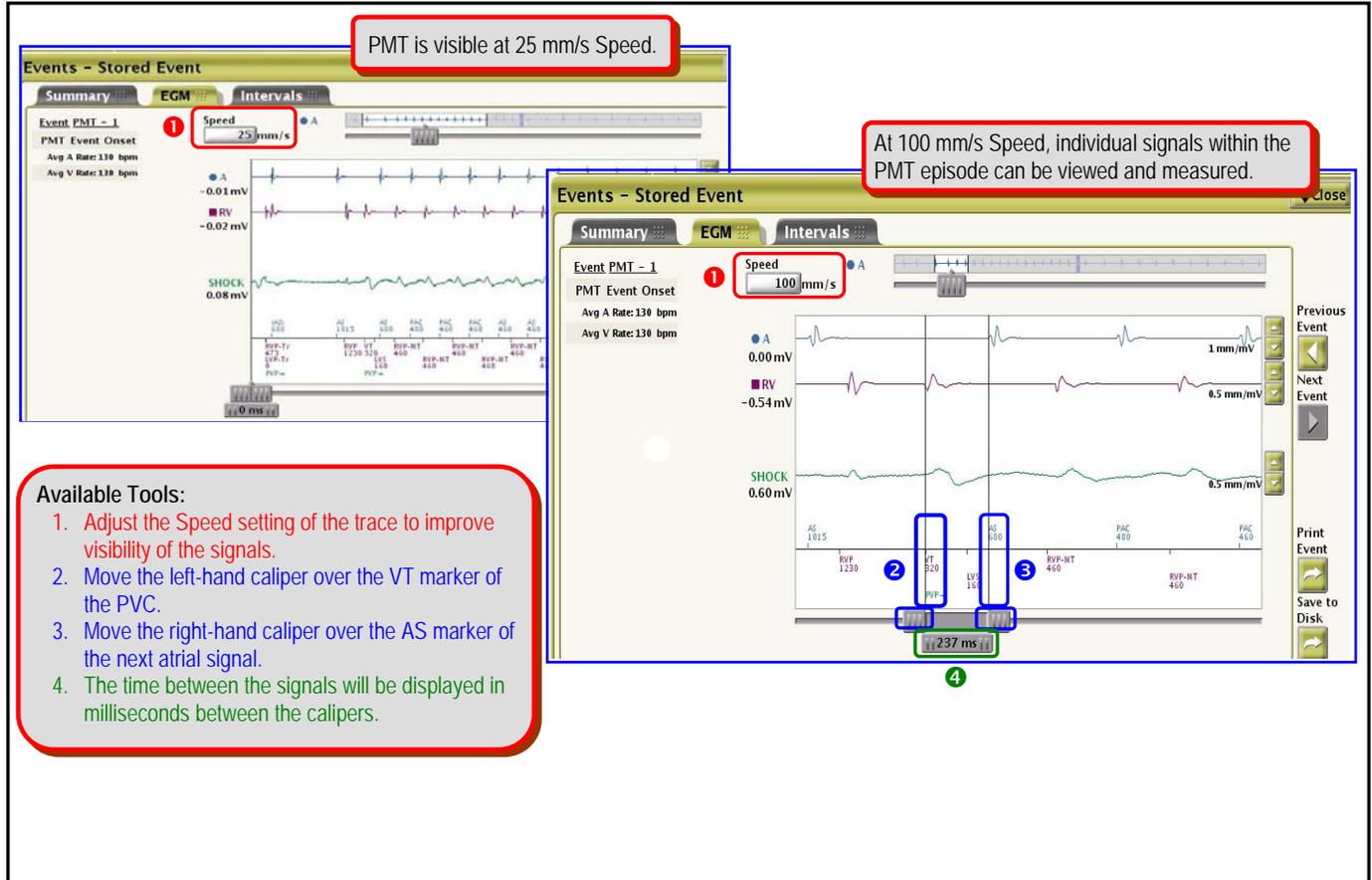

Figure 5. Stored PMT episode depicting various Speed settings and use of the calipers to measure signals.