

AcqKnowledge ECG Scoring Manual

Updated 2014/01/17

1. Setup for scoring

1.1. Download the AcqKnowledge datafile (e.g., "SAL001.acq") that you want to score onto your computer

1.2. Open the datafile in AcqKnowledge

1.2.1. Windows 7 prompt

1.2.1.1. Windows 7 may ask you if you want to allow AcqKnowledge to make "changes to the computer"

1.2.1.2. Say "Yes"

1.2.2. AcqKnowledge Hardware Prompt

1.2.2.1. If a dialogue box appears that says, "Choose MP150"

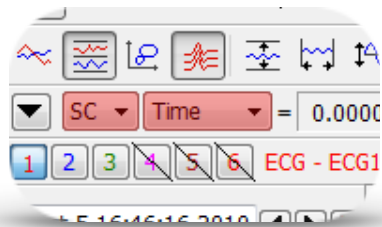
1.2.2.1.1. Ensure that "No hardware" is selected in the pull-down menu next to "Work with:"

1.2.2.1.2. Click "OK"

1.2.2.1.3. You may want to check the checkbox next to "Do not ask me again"

1.2.3. You will only need the ECG, Z0, and dZ/dT channels, so you can hide the extraneous channels (i.e., channels containing PPG, Skin Temp, GSR)

1.2.3.1. While holding down the "alt" key, click on the number of the channel you want to hide, and it should look like the picture to the right



1.3. Set the time units used by AcqKnowledge

(Note: you only have to do this once per computer on which you use AcqKnowledge)

1.3.1. Go to "Display" -> "Preferences"

1.3.2. Under "Measurements," find the pull-down menu for time units

1.3.3. Select "milliseconds" from the "Time Units" pull-down menu

1.4. Setup the "Measurements" bar to calculate relevant numbers

1.4.1. Along the top "measurements" pane, set the first three measurements to **Time**, **Delta T** (change in time), and **BPM**, as shown in the image below



2. Run the ECG Analysis

2.1. Do the initial "autoscoring" pass through the data

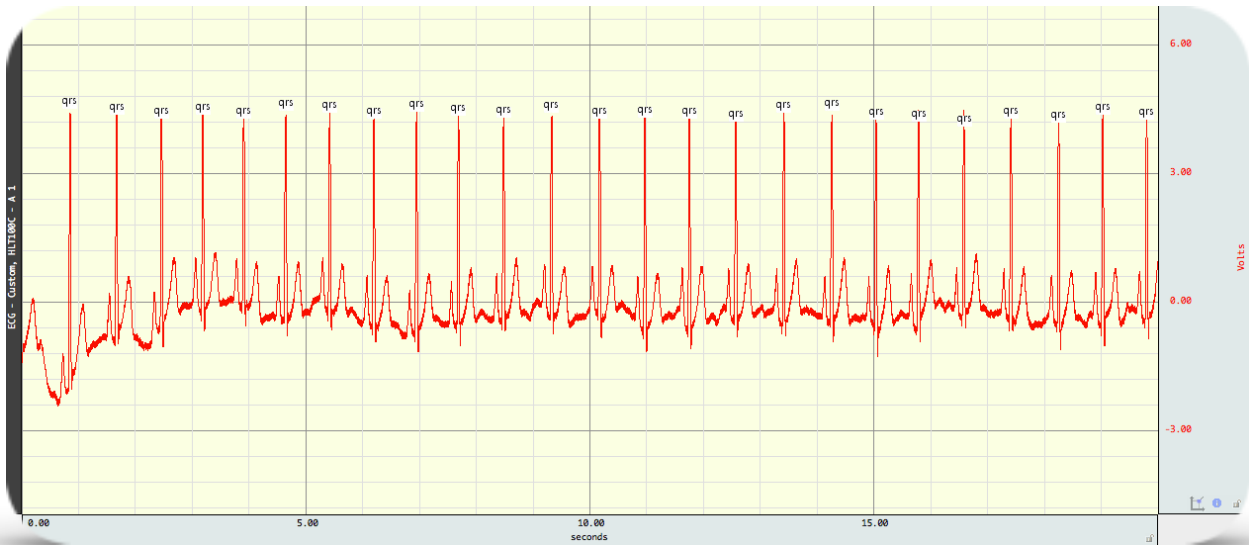
2.1.1. Click on the "bar" cursor, whose icon is shown to the right, to select it

2.1.2. Scroll back to the start of the file



- 2.1.3. After the bar cursor has been selected, click on the graph somewhere before the first beat of the heart
- 2.1.4. Go to "Analysis" -> "Find Cycle"
- 2.1.5. Under the "Cycles/Peaks" tab:
 - 2.1.5.1. Tell AcqKnowledge that you want to find cycles based on "peaks"
 - 2.1.5.2. Tell AcqKnowledge to "find peaks in" the ECG channel
 - 2.1.5.3. Choose the "positive/upward" peak direction
 - 2.1.5.4. Set the threshold level to be whatever value of volts that most R-spikes surpass and most noise in the ECG is below
 - 2.1.5.4.1. *Note: This will probably be different from one file to the next. The way to figure out what threshold value to enter here is to look at the data first.*
 - 2.1.5.5. You can leave all the other defaults as they are, unless you find that you need to change them
- 2.1.6. Under the "Selection" tab:
 - 2.1.6.1. Define the "Left Edge" as the "Previous Peak"
 - 2.1.6.2. Define the "Right Edge" as the "Current Peak" (this should already be done for you)
- 2.1.7. Under the "Output" tab:
 - 2.1.7.1. Click on the "Events" sub-tab
 - 2.1.7.2. Check the checkbox next to "Output Events"
 - 2.1.7.3. Under "Event 1," click on the first (left-hand) pull-down menu and select "None"
 - 2.1.7.3.1. *Note: This will remove all the options listed under Event 1, which is what you want*
 - 2.1.7.4. Under "Event 2," click on the first, left-hand pull-down menu and select "Right edge"
 - 2.1.7.4.1. *Note: Using your definition of the "Right Edge" in step 2.1.6.2, this setting will place an event at the top of each peak.*
 - 2.1.7.5. Ensure the second, right-hand pull-down menu says "At edge"
 - 2.1.7.6. Change the "Output type" to "Hemodynamic" -> "ECG Complexes" -> "QRS Peak"
 - 2.1.7.7. Change the "Output channel" to the ECG channel
- 2.1.8. Run the auto-scoring analysis**
 - 2.1.8.1. Click the "OK" button
 - 2.1.8.2. A message will pop up that says something like, "In order to create a measurement spreadsheet, a "Find All Cycles" operation must be performed. The spreadsheet will not be created without this operation. Do you want to perform "Find All Cycles" now?"
 - 2.1.8.2.1. Select "Yes"

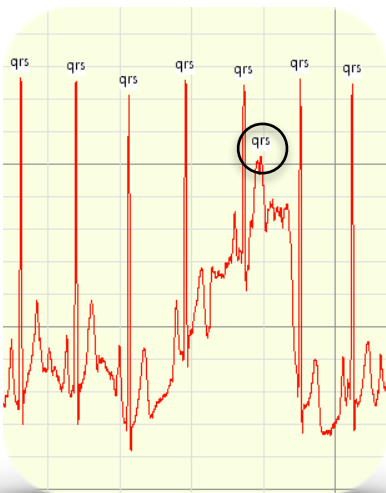
2.1.8.3.If all goes well, you will see a bunch of “QRS Peak” events placed on the top of each ECG wave. The scored ECG data should look something like this:



2.2.Review the automatically-placed markers (labelled “qrs”) for every beat to fix any badly placed markers

- 2.2.1.Zoom the screen to a good level of magnification for you to see how the event markers were placed
- 2.2.2.Starting at the beginning, scroll through the whole file and confirm that the QRS Peak ECG markers were placed well

2.2.3.If a marker is badly placed (i.e., it’s not at the R-point/peak of an ECG wave, like in the left-hand picture), then you will need to delete the bad marker and/or possibly add a new, correctly placed marker



2.2.3.1.Delete a bad marker by using the “Event Zap Tool”

- 2.2.3.1.1.Click on the icon that looks like a flag with a lightning bolt
- 2.2.3.1.2.Click anywhere in the graph to delete an event you don’t want
- 2.2.3.1.2.1.Hint: You can delete a lot of points at once if you click on the graph and drag

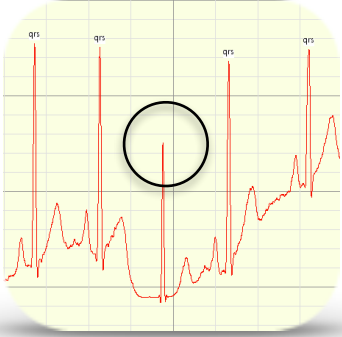
2.2.3.2.Add a good marker by using the “Event Tool”

- 2.2.3.2.1.Click on the icon that looks like a flag
- 2.2.3.2.2.Click and hold your mouse over the flag icon, and a sub-menu will appear
- 2.2.3.2.3.Select the type of event you want: “Hemodynamic” -> “ECG Complexes” -> “QRS Peak”



2.2.3.2.4. Click on the graph where you want to place the *QRS Peak* event

2.2.4. If an ECG wave is “missed” (i.e., you can clearly see an ECG wave, but AcqKnowledge did not place any ECG markers on it, like in the left-hand picture), then you will need to manually add the “QRS Peak” event



2.2.4.1. Select the type of event you want: “Hemodynamic” -> “ECG Complexes” -> “QRS Peak”

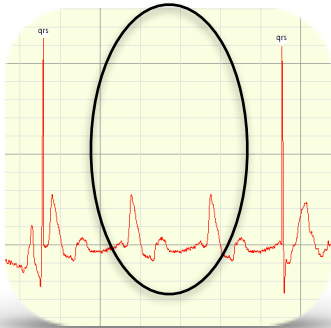
2.2.4.1.1. *Note: While AcqKnowledge is open, AcqKnowledge will remember the last event type you selected. So, you don’t have to do this step if you want to insert the same event that you last inserted.*

2.2.4.2. Use the magnifying glass tool to zoom in closely on the peak that you want to mark

2.2.4.3. Click on the graph at exactly the peak of the ECG wave to place the event marker in the correct place

2.2.4.4. Zoom back out by holding down the “Alt” or “Option” key while you click on the graph with the magnifying glass. When you have zoomed out sufficiently, autoscale the waveforms vertically.

2.2.5. If it seems as if the ECG signal totally disappears (like in the picture to the left), then you will need to manually insert “midbeat” markers



2.2.5.1. Insert as many midbeats as there are missing beats

2.2.5.1.1. Identify the borders of the bad signal, specifically find the time stamp (in milliseconds) of the last good ECG wave before the signal was lost and the first good ECG wave after the signal was lost

2.2.5.1.1.1. *Note: To exactly find the time of the two good ECG events that surround the part of the wave where you need a midbeat, open the “Event Palette”*

2.2.5.1.1.2. Go to “Display” -> “Show” -> “Event Palette”

2.2.5.1.1.3. Navigate to the section of the file that you are working on and identify the two good ECG events that surround the area that needs a midbeat

2.2.5.1.1.4. Take note of the exact time of these two good events and proceed with the next step (i.e., step 2.2.5.1.2)

2.2.5.1.2. Determine the time in between these two good beats, by subtracting the milliseconds of the first beat from the milliseconds of the last beat

2.2.5.1.3. Based on the typical interval between surrounding beats, determine how many beats are missing in the lost signal

2.2.5.1.4. Divide the time span you identified in Step 2.2.5.1.1. by the number of missing beats you determined in step 2.2.5.1.3.

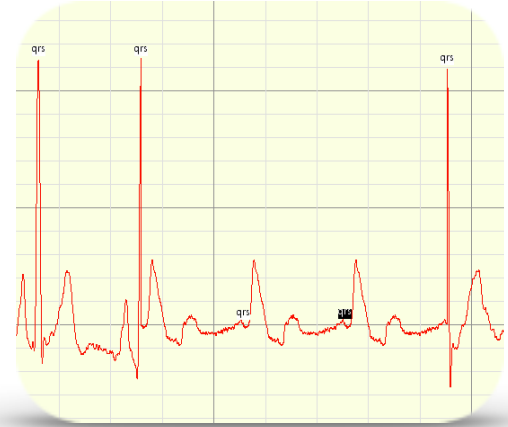
2.2.5.1.4.1. This resulting interval is the time that should be between each of the midbeats

2.2.5.1.4.2. Progressively add this interval to the time stamp of the last good beat to determine the exact timestamp to use for each of the midbeats

2.2.5.2. Add the midbeats to the graph

2.2.5.2.1. With the “QRS Peak” event type selected, click on the graph for as many times as there are missing beats

2.2.5.2.2. Using the Event Palette, click on each of the newly added qrs markers and change their “Location” to be the midbeat time stamps you found in step 2.2.5.1.4.2. In the end, you should have something that looks like this:



3. Export the ECG Data

3.1.1. Click on the “bar” cursor to select it

3.1.2. Scroll back to the start of the file

3.1.3. Click on the graph somewhere before the first beat of the heart

3.1.4. Go to “Analysis” -> “Find Cycle”

3.1.5. *Note: Your settings should be the same as your initial auto-scoring pass, and AcqKnowledge should have saved your previous responses, unless you closed AcqKnowledge in the meanwhile. See steps 2.1.5 - 2.1.7. for the settings if you need to re-enter them. However, you need to change one “output” setting.*

3.1.6. Under the “Measurements” sub-tab of the “Output” tab:

3.1.6.1. Click on the checkbox next to “Save measurements into Excel spreadsheet file”

3.1.6.1.1. You can keep all the defaults for the options that become available after you click that checkbox

3.2. Click the “OK” button

3.3. A message will pop up that says something like, “In order to create a measurement spreadsheet, a “Find All Cycles” operation must be performed. The spreadsheet will not be created without this operation. Do you want to perform “Find All Cycles” now?”

3.3.1. Select “Yes”

3.4. If all goes well, a spreadsheet will open (this may take a while, as the spreadsheet program must open)

4. Save Your Work

4.1. When Excel opens, save the worksheet as “[Original Filename]-ECG.xlsx”

4.2. Save the acqknowledge file as “[Filename]-ECG-[Your Initials].acq”

;; Great Job!!