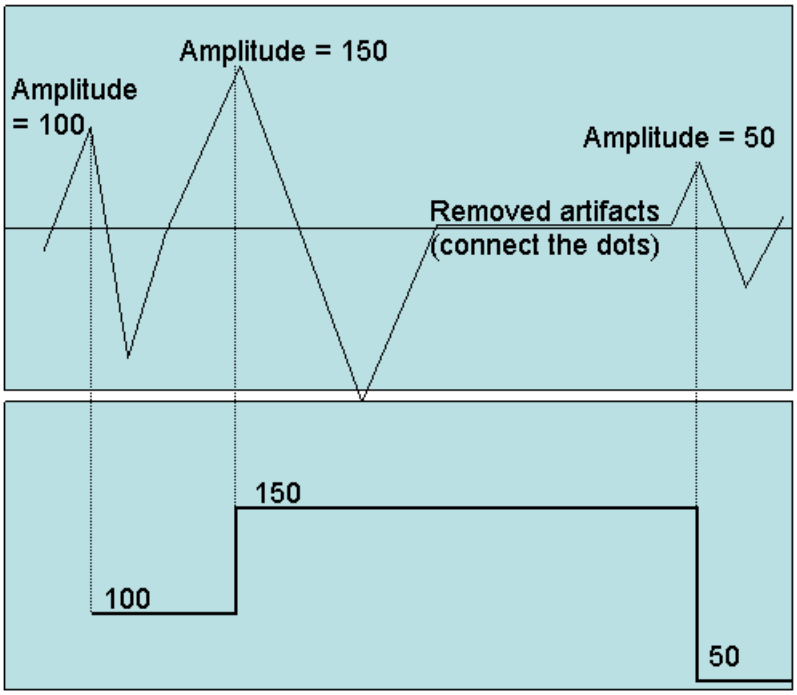
New VPA Peak Picking Procedure

by Nicole Prause and Erick Janssen

Demonstration of why the current procedure is problematic:

Expected average peak amplitude for this 5 sec window:

= (100+150+50)/3 peaks
= **100**

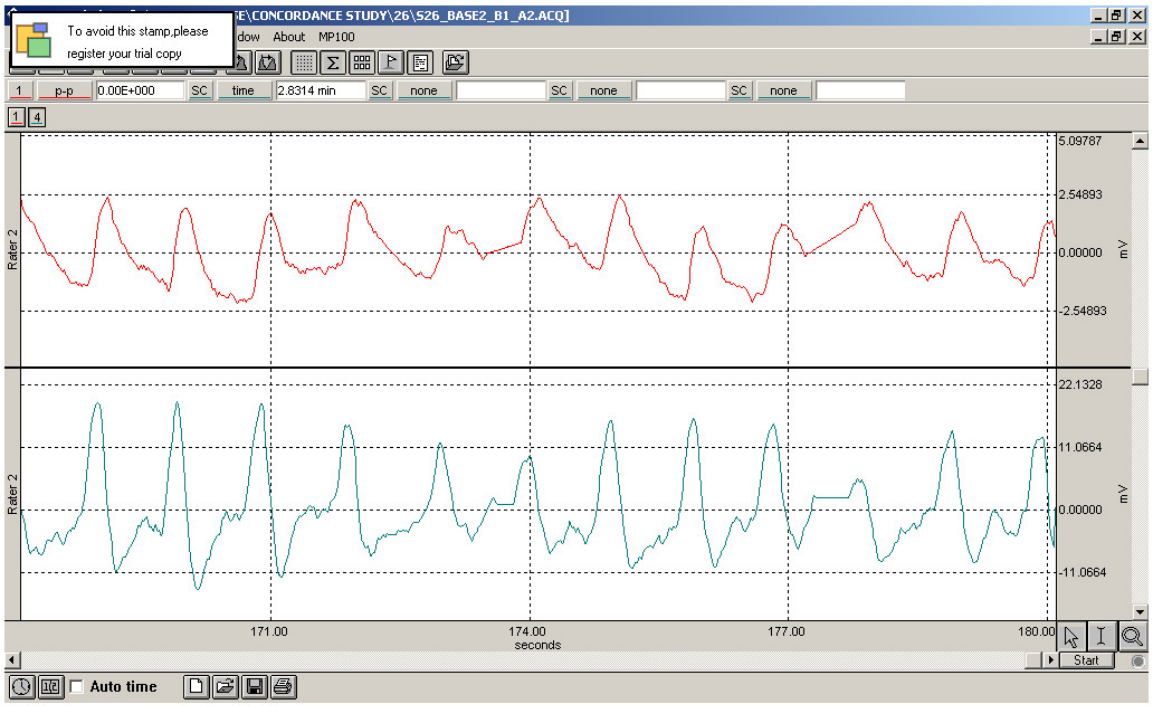


Incorrect average peak amplitude according to ACQ "find rate" procedure:

= (100*1.1 sec + 150*3 sec + 50*.9 sec)/5 sec
= (100*44 samples + 150*120 samples + 50*36 samples)/200 samples
= (4400 + 18000 + 1800)/200
= **121**

Corrected peak-picking method

Explanation: You are making a second channel in which you will exaggerate the peaks in your original signal. The program will use this channel to show it the start and end points in time to search for a max and min value (hence the amplitude) in the original signal. The output contains the amplitude of every peak in the first column and the time that peak occurred in the second column.



I. Copy the VPA channel

a. Select the VPA channel by clicking on it with the arrow tool
b. Edit→ Duplicate waveform

II. Smoothing

a. Select the new channel by clicking on it with the arrow tool
b. Transform→ Smoothing
c. Samples = 15[1]
d. Mean value smoothing

III. Peak enhancement

a. Transform → Difference[2]
b. Intervals between = 2
c. Check "Transform entire wave"

IV. **Training the peak detector** (you will essentially use the duplicated channel to "train" the peak detector where to find the peaks in the original signal)

a. The calculations windows across the top of the ACQ file should look like this:

i. VPA | p-p | SC[3] | time | SC | none | SC | none | SC | none

b. Ensure the new channel is selected by clicking on it with the arrow tool
c. Transform → Find peak
d. Threshold level = 10^4
e. Threshold: Fixed
f. Check "paste measurements into journal"
g. Click OK

1. Smoothing needs will depend on your signal. For instance, signals highly oversampled generate more high frequency noise than signals sampled at lower rates and may require a higher smoothing value. Low pass filters accomplish very similar effects.

2. "Difference" in the way BioPac defines it appears to be different from Differencing used in signal processing to correct a drifting baseline. The manual provides more details.

3. This could really be set to any channel because absolute time will be the same for all channels.

4. This requires the most modification/experimentation and will vary considerably depending on laboratory-specific features (e.g., amplification). This can be modified separately for each participant to get the best value, I think, with minimal measurement error introduced, so long as the threshold is always the same within the same subject over conditions.

To bin the amplitude data (average within time intervals), you may wish to use an SPSS syntax file resembling this:

```
GET DATA  /TYPE = TXT
 /FILE = 'INSERT FILE PATH HERE.TXT'
 /DELCASE = LINE
 /DELIMITERS = "\t "
 /ARRANGEMENT = DELIMITED
 /FIRSTCASE = 1
 /IMPORTCASE = ALL
 /VARIABLES =
 amplitude F8.2
 time F8.2
 time0_10 F1.0
 .
CACHE.
EXECUTE.

 IF (time<=10) sec0_10  = mean(amplitude) .
 IF (time>=10.001 and time<=20) sec10_20  = mean(amplitude) .
 IF (time>=20.001 and time<=30) sec20_30  = mean(amplitude) .
 IF (time>=30.001 and time<=40) sec30_40  = mean(amplitude) .
 IF (time>=40.001 and time<=50) sec40_50  = mean(amplitude) .
 IF (time>=50.001 and time<=60) sec50_60  = mean(amplitude) .
 IF (time>=60.001 and time<=70) sec60_70  = mean(amplitude) .
 IF (time>=70.001 and time<=80) sec70_80  = mean(amplitude) .
 IF (time>=80.001 and time<=90) sec80_90  = mean(amplitude) .
 IF (time>=90.001 and time<=100) sec90_100  = mean(amplitude) .
 IF (time>=100.001 and time<=110) sec100_110  = mean(amplitude) .
 IF (time>=110.001 and time<=120) sec110_120  = mean(amplitude) .
 IF (time>=120.001 and time<=130) sec120_130  = mean(amplitude) .
 IF (time>=130.001 and time<=140) sec130_140  = mean(amplitude) .
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 IF (time>=140.001 and time<=150) sec140_150  = mean(amplitude) .
 IF (time>=150.001 and time<=160) sec150_160  = mean(amplitude) .
 IF (time>=160.001 and time<=170) sec160_170  = mean(amplitude) .
IF (time>=170.001 and time<=180) sec170_180  = mean(amplitude) .
EXECUTE .
```