ANT+ Power Transmission Quiz

Mark Rages
March 2013

1. **How frequently does the Quarq power meter sample?**

   a. 4 Hz
   b. 60 Hz
   c. 1 Hz
   d. It depends

2. **How long of a signal dropout can an Ant+ power transmission link sustain before the average value of torque is lost?**

   a. One second
   b. One crank revolution
   c. Three seconds
   d. It depends on how hard you pedal

3. **To make an accurate record of the power data, what should a head unit record during an RF dropout?**

   a. Zero
   b. Nothing
   c. Wait and see
   d. Repeat last power value

4. **If Quarq-measured cadence for one crank revolution is 60 RPM, what is the real cadence?**

   a. 60 RPM +/- 1 RPM
   b. 60 RPM +/- 50 ppm
   c. 60 +/- 0.03 RPM
   d. It's 60, trust us

5. **If Quarq-measured average cadence for a twelve-hour ride is 60 RPM, what is the real cadence?**

   a. 60 RPM +/- 1 RPM
   b. 60 RPM +/- 0.003 RPM
   c. How are your knees feeling?
   d. It's 60, trust us

1. **How frequently does the Quarq power meter sample?**

   Answer: b, 60 Hz. The power meter samples torque internally at 60 Hz. At the conclusion of each rev, the average torque and cadence period are computed and transmitted up the head unit

2. **How long of a signal dropout can a Ant+ power transmission link sustain before the average value of torque is lost?**

   Answer: d, it depends. The average torque and cadence can be computed between any two Ant messages, until the accumulator fields in the message overflow and wrap around. The length of time until the torque message overflows depends on the amount of power being produced. The Ant spec reckons that torque will overflow in 64 seconds at 200W.

3. **To make an accurate record of the power data, what should a head unit record during an RF dropout?**

   Answer: c, wait and see. The average torque and cadence (and therefore, a close estimate to the average power) of the power meter can be determined when the signal returns after signal breaks of up to a minute or more, depending on power being recorded. Therefore, waiting until the next message to record anything over the gap is the most correct method of handling dropout.

   In particular, it is always a mistake to record zero for unknown power. Zero power is a meaningful value, and indiscriminately adding zero power numbers will disrupt almost every power-based training metric. The practice of using 0 for "no signal" originates with heart rate monitors, where 0 BPM is an out-of-band value (for living persons) and will never be interpreted as a valid reading.

4. **If Quarq-measured cadence for one crank revolution is 60 RPM, what is the real cadence?**

   Answer: c, +/- 0.03 RPM. The Ant+ spec specifies a 1/2048 second cadence period accuracy. Quarq reed and magnet timing is repeatable and limited by the Ant accuracy.

5. **If Quarq-measured average cadence for a twelve-hour ride is 60 RPM, what is the real cadence?**

   Answer: b, +/- 0.003 RPM. Errors in measuring cadence are non-accumulating, that is, if a stroke measures a few microseconds too short, the next stroke will be a few microseconds too long to compensate. Therefore, long-term cadence accuracy is only down to the clock accuracy, which in the Quarq is better 50 parts-per-million.