

Dear **C Wonnacott**

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### 1. Is your 1PPS really 1 Pulse per Second?

The accuracy of the 1PPS signal from the GPS receiver varies from manufacturer to manufacturer. The main causes of inaccuracy of 1PPS pulses from the GPS receiver are: bias (this a fixed offset due to delay errors in the receiver/antenna system), drift (variations in timing over long periods due primarily to differences in satellites tracked over time), and jitter (short term variations in timing from pulse to pulse). These error sources are inherent in the both the GPS system and the GPS receiver design and implementation and can result in errors of >100ns.

Quartzlock's A6-1PPS Locking Module provides after only 1,000s averaging time a "cleaned" 1PPS that is derived from the internal oscillator (as opposed to coming directly from the GPS receiver). When the oscillator is phase-locked to 1PPS from the GPS receiver, timing accuracy is further improved in the "cleaned" 1PPS output because the signal is essentially jitter free.

The locking module is designed to lock a stable 10MHz internal oscillator to the unstable GPS 1PPS. A "cleaned" and stable 1PPS is generated by using a 3 stage Kalman Filter. This filter algorithm measures and corrects the frequency offset of the internal oscillator with respect to the 1PPS input.

An added benefit is the "holdover mode" in the event of loss of the 1PPS input. Measured values of past offsets and drifts are used to continually correct the internal oscillator during holdover. The internal clock analogue interpolator is self calibrating.

### 2. Newsletter sign up

We'd like to send you occasional email newsletters with items of interest to the time and frequency community, press releases and new product information. To request the newsletter [please sign up here](#). We will not send more than 1 newsletter a month on average.

Kind regards

Quartzlock