

Hydroacoustics UPDATE: Use of GPS with ADCP's: Baud Rates and Update Rates

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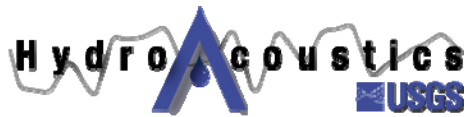
INTRODUCTION

GPS receivers are now able to output data at 2, 5, 10, and 20 Hz instead of only at 1 Hz as was previously common. Several users have tried to use these higher update rates with mixed results. The primary problem appears to be that when the receiver is asked to output more data, the baud rate must also be set higher to accommodate the data being transmitted. If the baud rate is set too low, the communications port is not able to transfer all of the data in a timely fashion and a delay and/or dropped data results. The most bothersome problem is the delay. Delays of up to 8 seconds have been observed. These types of delays result in incorrect water velocities because the GPS does not reflect the speed and direction of the boat at the instant the water ping was accomplished.

Currently the use of 10 and 20 Hz data is not recommended for use with WinRiver II version 2.0 and earlier due to the internal design of the program. This limitation is being investigate and will likely be removed in a future version.

DISCUSSION OF TESTS

A series of test were conducted with an AgGPS 132 using both WinRiver 10.05.02 and a user developed program that logged data and inserted time tags at approximately 2 second intervals. The results from both programs were identical indicating no apparent problems in the way WinRiver is handling the faster updates for GPS (tests are underway for Sontek RiverSurveyor, no problems are anticipated but testing has not been completed). Tests were conducted with the following settings:



GPS Update	Baud Rate	GGA sent	VTG sent	GSV sent
1 Hz	4800	x		
5 Hz	4800	x		
10 Hz	4800	x		
1 Hz	4800	x	x	x
5 Hz	4800	x	x	x
10 Hz	4800	x	x	x
1 Hz	38.4k	x		
5 Hz	38.4k	x		
10 Hz	38.4k	x		
1 Hz	38.4k	x	x	x
5 Hz	38.4k	x	x	x
10 Hz	38.4k	x	x	x

A postprocessing program was written to determine the number of characters and thus the number of bits transmitted per second for each of the configurations. From this analysis it was very clear that the observed delays were a function of the baud rate and number of characters transmitted per second (Figure 1). Given the results shown in Figure 1 it appears that to be safe the number of bits should be less than 75% of the baud rate, where the number of bits equals the number of characters times 9, assuming 8 data bits, 1 stop bit, and no parity. On the basis of these observations, GENERAL recommendations for baud rates are as follows:

GPS Update Rate	Baud Rate
1 Hz	4800 or higher
5 Hz	19.2k or higher
10 Hz	38.4k or higher

Note: These general recommendations are based on the described tests of a single GPS unit. The characteristics of other units and/or configurations may vary. If you find these recommendations do not work for your GPS unit please contact me (dmueller@usgs.gov).

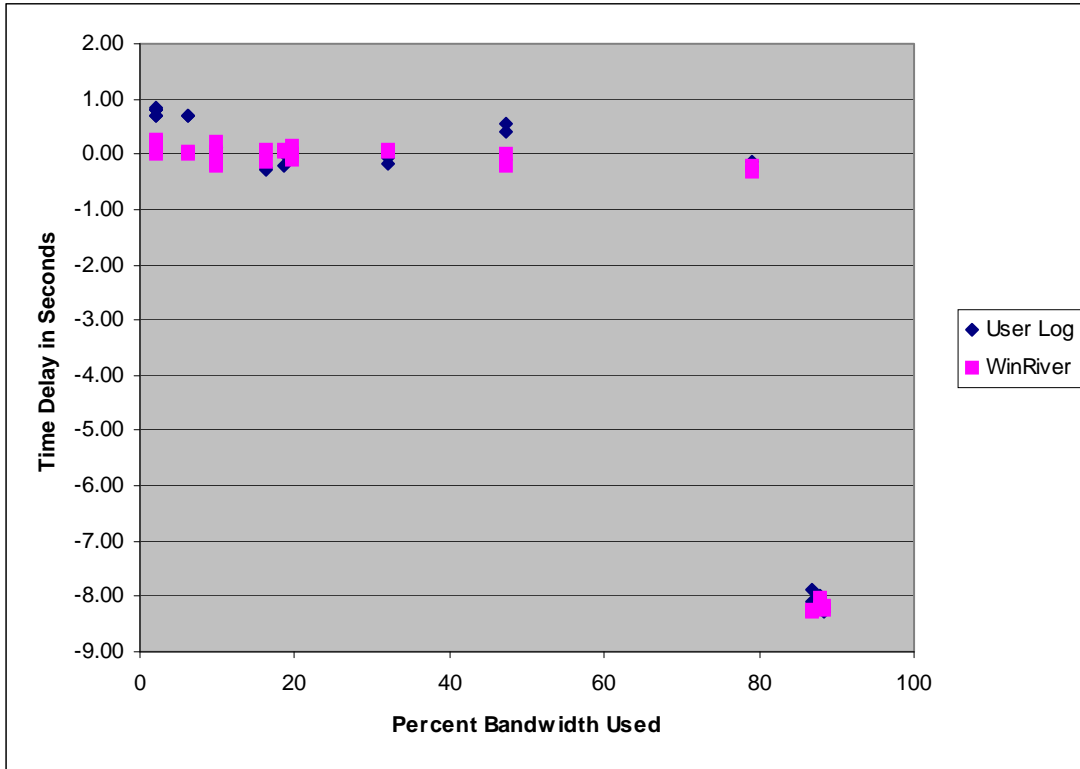


Figure 1. Effect of percent bandwidth used (number of characters per second * 9/baud rate) on the time delay in GPS positions.

SUMMARY

The baud rate for communications with the GPS receiver must be set higher than the default 4800 baud for update rates higher than 1 Hz. Update rates greater than 5 Hz could be a problem with WinRiver II version 2.0 or earlier.