Precision Time by GPS for MRAO

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Note: The following descriptions are excerpts from websites related to the topic.

Project Status at MRAO:

My development cycle is very early for this project. At a hardware level, I am currently fitting a Garmin GPS 18 x LVC unit (purchased from Amazon for $64) with a male DB9 serial port and USB connector. The USB port provides power to the GPS unit. This sensor will be connected to a Dell Desktop computer running Windows 7 64 bit. Software to drive the system is currently under evaluation but it likely to be freeware from the University of Delaware Time laboratory, which is associated with NIST. The first working prototype deadline is 15 September 2013.

Sensor description: (Source : Garmin Technical Description)

"These products interface to a serial port. The units accept TIA-232-F (RS-232) level inputs and transmit voltage levels that swing from ground to the positive supply voltage, TIA-232-F (RS-232) polarity. They also have reverse polarity protection. The cable contains wires for power, ground, receive, transmit, and measurement pulse output.
At the end of the cable, the wires are terminated in a connector that is used by Garmin for testing purposes. Most customers will remove this connector and replace it with another connector of their own choosing. Removing the factory installed connector and/or replacing with another customer-supplied connector will have no affect on the warranty (see section 1.2 Limited Warranty).

How it works:

4.4 MEASUREMENT PULSE OUTPUT (GPS 18x LVC & 18x-5Hz ONLY)
4.4.1 One-Pulse-Per-Second (PPS) Output (GPS 18x LVC Only)
The highly accurate one-pulse-per-second (PPS) output is provided for applications requiring precise timing measurements. After the initial position fix has been calculated, the PPS signal is generated and continues until the unit is powered down. The rising edge of the signal is aligned to the start of each GPS second within 1 µs for all conditions in which the receiver reported a valid and accurate position for at least the previous 4 seconds.
The NMEA 0183 sentences that follow each rising edge of the PPS signal tell when you were and where you were at that previous rising edge of the PPS signal, beginning with the GPRMC sentence as the lead sentence in any particular NMEA 0183 record.

Regardless of the selected baud rate, the information transmitted by the GPS 18x series products is referenced to the pulse immediately preceding the NMEA 0183 RMC sentence.
The accuracy of the one-pulse-per-second output is maintained only while the GPS receiver is computing a valid position fix. To obtain the most accurate results, the one-pulse-per-second output should be calibrated against a local time reference to compensate for cable and internal receiver delays and the local time bias.
The default pulse width is 100 ms, however; it may be programmed in 20 ms increments between 20 ms and 980 ms".

Guidance:

Time synchronization with a Garmin GPS - http://www.lammertbies.nl/comm/info/GPS-time.html

Pulse-Per-Second (PPS) Signal Interfacing - http://www.eecis.udel.edu/~mills/ntp/html/pps.html

Windows Serial Port GPS/PPS reference clock for NTP - http://www.satsignal.eu/ntp/NTP-on-Windows-serial-port.htm

General Interest Time and Frequency Publications - http://www.nist.gov/pml/div688/generalpubs.cfm