MAGELLAN®

PROFESSIONAL

Latency on the “500 Series”

Technical Note

Revision 1.0

June 22, 2009

1 Revision History

Track the revision history of the Document.

Release	Date	Author	Comments
1.0	June 22, 2009	O. Casabianca	Creation

2 Acronyms

GG GPS/ Glonass
GNSS Global Navigation Satellite System
GPS Global Positioning System
N/A Not applicable
NMEA National Marine Electronics Association
NTRIP Networked transport of RTCM via Internet Protocol
OS Operating System
PPS Pulse Per Second
PVT Position Velocity Time
RTCM Radio Technical Commission for Maritime Services
SBAS Satellite Based Augmentation System
TBC To be confirmed
TBD To be defined
USB Universal Serial Bus
WAAS Wide Area Augmentation System

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4 Scope

The scope of this document is to provide technical information about latency inside the “500 Series” from Magellan Professional. As explained here-below the common technologies and design allow a sub-25ms latency in typical conditions for all the 500 products.

Magellan Professional GNSS receivers “500 Series” is composed by:

- MB 500 GNSS board:

- ProMark 500 GNSS receiver

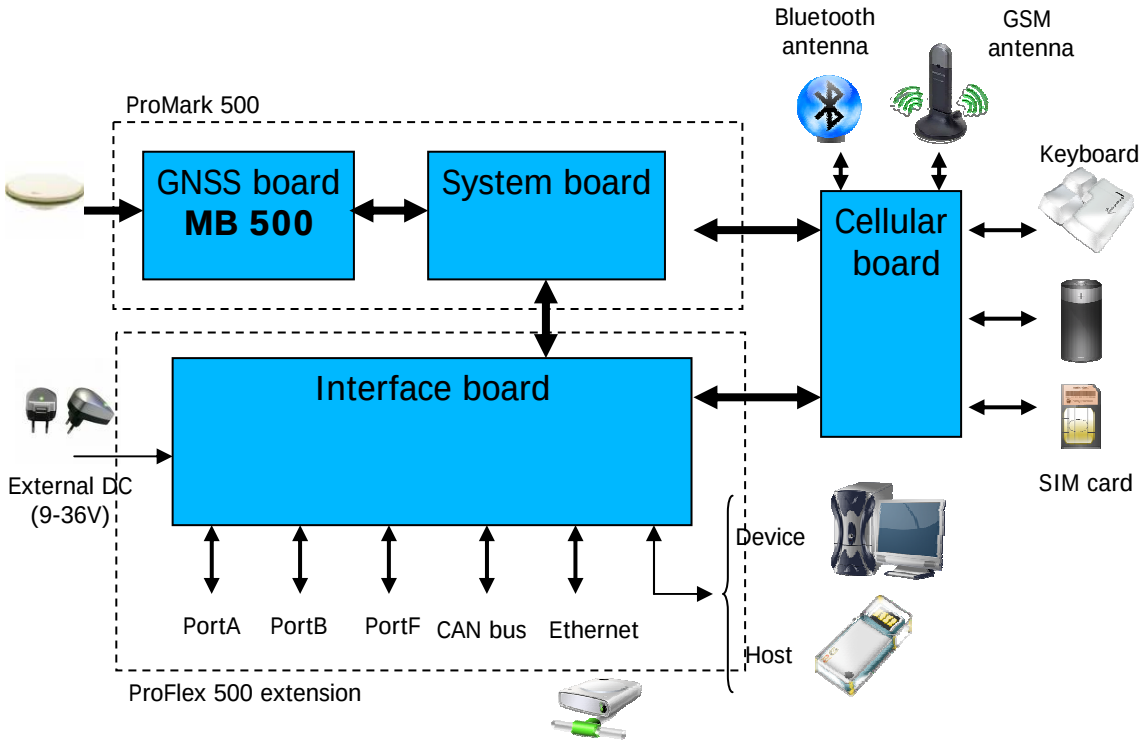
- ProFlex 500 GNSS receiver

The heart of the “500 Series” is the MB 500 which is a 75-channel GNSS board that tracks dual-frequency GPS and GLONASS signals as well as SBAS ranging signals, all of which are optimally processed by the patented BLADE™ technology for high-performance RTK accuracy and optimal operational productivity.

In all these products, the latency is mainly driven by the MB 500 GNSS board, and completely for the board itself as a standalone OEM device.

5 ”500 series” architecture

The overall architecture is described in the following diagram.



ProFlex 500 and ProMark 500 basically share three (3) electronic boards:

- The MB500 board as the GNSS core receiving and processing GNSS signals.
- System board is in charge of all communications aspects. This board supports the main processor and the Linux operating system.
- Cellular board, supporting the GSM modem and its SIM card reader, the Bluetooth module, the front panel keyboard, as well as the battery connection.

On top of this ProFlex 500 also includes a specific interface board to expand the connectivity capabilities and managing specific electrical interfaces (Voltage isolation, Power supplies, drivers, MAC Ethernet, etc…).

Sharing same technologies and pieces in all configurations, the “500 series” exhibit similar behaviors as far as latency which is really and first defined by the performances of the MB500 board.

6 Latency

The whole GNSS engine (tracking, acquisition, PVT engine) resides inside the MB 500 GNSS board, while the System Board and Interface boards deal mainly with the input/output tasks.

The latency is measured from a PPS signal outputted from the receiver and corresponds to the reception of the first character of a NMEA message, typically the GGA which contains date and position.

The latency is highly dependant on the way the receiver is set-up:

- A receiver working in natural GPS mode or DGPS mode will not have the same latency than a receiver working in RTK mode,
- Tracking and usage of GLONASS satellites inside the solution introduce “mechanically” a higher latency,
- Quantity of data to output has also a high impact on the latency: a receiver which output only GGA information on 1 single port will have a much lower latency than a receiver outputting at the same time many NMEA messages on several serial ports plus raw data output plus…

Based on the architecture of the ProMark 500 and ProFlex 500, the latency is similar inside these 2 GNSS receivers and introduces a delay on the latency measured on the MB 500 board itself.

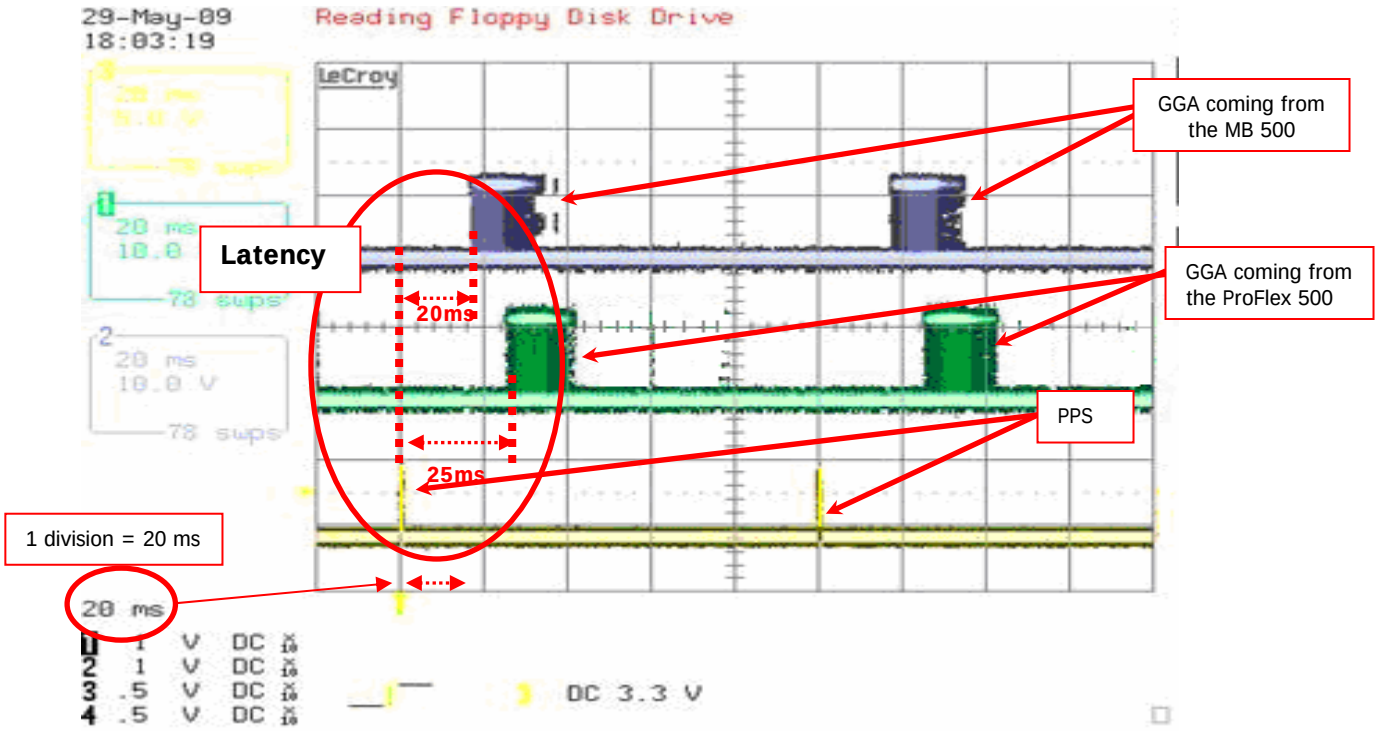
The MB 500 is configurable to work with internal data at 10 Hz or 20 Hz. The better results in terms of latency are obtained while the receiver is set-up to work with internal data at 20 Hz, whatever is the output data rate (i.e. the receiver should be configured in POP20 mode).

The following measurements were done both on a ProFlex 500 and on the ProMark 500 yielding similar behaviours. The configuration was the following:

- POP20 mode,
- RTK fixed in GPS+GLONASS mode with GPRS connection
- GGA output at 10Hz on Port A
- PPS output at 100ms periodicity

The following diagram shows:

- in blue the GGA message at the MB 500 at 10 Hz
- in green line shows the GGA output of ProFlex 500 at 10Hz
- in yellow line shows the PPS output at 100ms periodicity



In such typical RTK Survey mode with GPRS link and a 10 Hz GGA output rate, the results are:

- Latency on the ProFlex 500 and ProMark 500 ~25ms typical
- Latency on the MB 500 ~20ms typical

  ProFlex 500 and ProMark 500 architecture introducing a maximum of 5ms delay

It has been noticed that a RTK engine is more time consuming (especially in GPS+GLONASS dual frequency mode) than standard GPS, DGPS or SBAS DGPS engine. Thus the values given here can be considered as a “worst case” scenario in a typical configuration, and a SBAS DGPS positioning demonstrates typically a ~10ms latency.

7 Conclusion

The “500 Series” from Magellan Professional have been designed to secure a sub-25ms latency in typical conditions and for the most common RTK configurations.

This is applicable to the MB 500, ProMark 500 and ProFlex 500 products.

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