

Using the 3DM-GX3[®]-45 with Bluetooth[®] RS-232 Adapters

Overview

MicroStrain's 3DM-GX3[®]-45 high-performance, miniature GPS-Aided Inertial Navigation System (GPS/INS) combines MEMS inertial sensors, a highly-sensitive embedded GPS receiver, and a complex Extended Kalman Filter to generate optimal position, velocity, and attitude (PVA) estimates. It is currently available with RS-232 and USB communication interfaces. A wireless communication interface can easily be added by employing off-the-shelf Bluetooth[®] RS-232 adapters.

The [Sena Technologies, Inc. Parani[®]-SD200L](#) is a Class 2 Bluetooth[®] Serial Adapter that transmits 30 meters (or more with range extending antenna) and has an internal rechargeable battery. The SD200L measures just 95mm long x 16mm wide x 20mm high, and when coupled with the 3DM-GX3[®]-45, provides a wireless inertial sensor package with a very small footprint.



This technical note describes a particular approach to connecting the 3DM-GX3[®]-45 to the Bluetooth[®] serial adapter and establishing communication with a host PC using a terminal program. The reader will understand that many other approaches can be taken using different Bluetooth[®] devices, computer hosts (including PCs, microprocessors, SBCs, etc.), communication software and coding languages. This technical note demonstrates the basic principle. Familiarity with the 3DM-GX3[®]-45, MIP Monitor software and its data communication protocol is assumed.

3DM-GX3[®]-45 Setup

The 3DM-GX3[®]-45 was initially run with MIP Monitor and a startup configuration was saved to memory as follows:

- Continuous mode
- 25 Hz sampling rate
- Estimated LLH position data
- Estimated Euler angles data
- GPS Timestamp data

With this startup configuration set, applying power to the 3DM-GX3[®]-45 will cause it to begin continuous output of these three data quantities at 25 Hz.

Connecting the 3DM-GX3[®]-45 and the SD200L

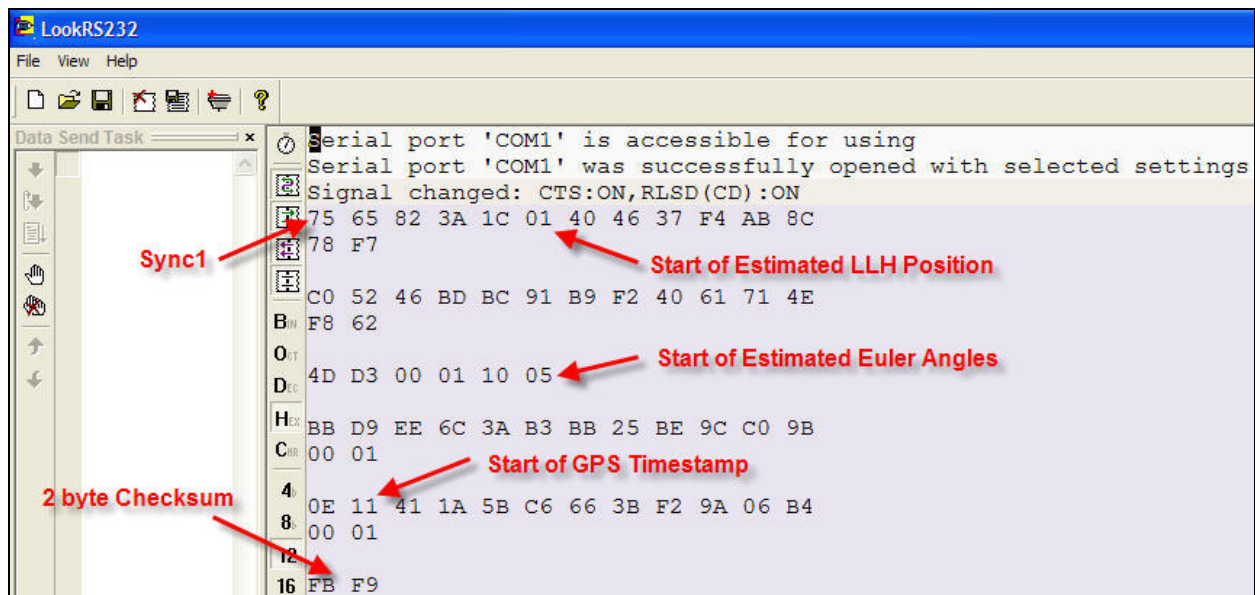
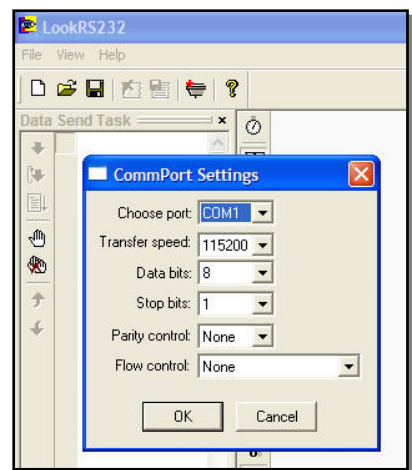
Two SD200L Bluetooth[®] serial adapters were employed. Following the quick start guide provided with the adapters:

- the internal batteries of the adapters were charged;
- the baud rates were set on the adapters to 115200 (the default 3DM-GX3[®]-45 baud rate) by flipping the dip switches;
- the Bluetooth[®] adapters were 'paired' using the 7 step Quick Pairing method;
- one Bluetooth[®] adapter was connected to a standard 9 pin serial port on a Windows[®] XP Pro PC using an RS-232 cable;
- the 3DM-GX3[®]-45 was connected to its standard RS-232 communication and power cable (power was not yet applied);
- the RS-232 communication cable and the SD200L were connected using the 9 pin gender changer that comes with the SD200L.

Testing the Bluetooth Connection

[LookRS232](#), a communication debugging software, was employed on the PC (any such communication software or terminal program will work). A connection was established in LookRS232 at baud=115200, data bits=8, stop bits=1, parity control=none, flow control=none.

Power was applied to the 3DM-GX3[®]-45 and the expected 64 byte data packets containing estimated LLH position, estimated Euler angles and GPS timestamp were immediately and continuously received at 25 Hz **without error**, as shown below.



Further Testing

Using the same procedures, the sampling rate was increased to 50 Hz for all 3 data quantities and it was found that the Bluetooth® serial adapters were able to maintain the 50 Hz sampling rate **without error**.

The maximum sampling rate for navigation data quantities from the 3DM-GX3®-45 is 100 Hz. The sampling rate was increased to 100 Hz for all 3 data quantities and it was found that the Bluetooth® serial adapters were again able to maintain the 100 Hz sampling rate **without error**.

Conclusion

Off-the-shelf Bluetooth® serial adapters used with an older host PC operating at 115200 baud produced several navigation data quantities at 100 data packets per second. To the writer, this high sampling rate was unexpected and leads one to believe that higher rates could be achieved with better processors, higher baud rates and other Bluetooth® equipment.

Support

MicroStrain support engineers are always available to expand on this subject and support you in any way we can.

