

3DM-GX4™

Using a 3DM-GX4-45™ with Bluetooth® RS-232 Adapters

Overview

The LORD MicroStrain® [3DM-GX4-45™](#) high-performance, GPS-Aided Inertial Navigation System (GPS/INS) combines MEMS inertial sensors, a highly-sensitive embedded GPS receiver, and an 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-GX4-45™, provides a wireless inertial sensor package with a very small footprint.

This technical note describes a particular approach to connecting the 3DM-GX4-45™ 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-GX4-45™, MIP™ Monitor software and its MIP™ data communication protocol is assumed.



3DM-GX4-45™ Setup

- Connect the USB or RS-232 communication cable to the host computer as normal.
- Launch MIP™ Monitor software and establish communication with the inertial sensor as normal.
- Click Settings.
- Click Device and the Device Setup screen will appear.
- Click the Estimation Filter tab.
- Click the Message Format tab.
- Select Position (LLH), Attitude (Euler RPY), and GPS Time, all at 25 Hz in the Message Format drop-down.
- Click the EF Options tab.
- Select:
 - Vehicle Dynamics Mode = Portable
 - GPS Update Mode = Internal GPS
 - Heading Update Input Source = Internal Magnetometer
 - Enable Auto EF Initialization = Checked
- Click the GPS tab.
- Click the Message Format tab and insure that no other data quantities are selected for output.
- Click the IMU-AHRS tab.
- Click the Message Format tab and insure that no other data quantities are selected for output.
- Click OK and the Device Setup screen will disappear.
- Click the blue Start Streaming Data icon to begin sampling and outputting the selected data quantities at 25 Hz.
- Click Settings.
- Click Save Current Settings and an information window will appear indicating that the current settings will be written to non-volatile memory.
- Click OK and the information window will disappear.

- **Note:** By clicking OK, we have configured the inertial sensor to automatically and continuously output the selected data quantities at 25 Hz each time it is powered up.
- Disconnect the power and reconnect the power. Now observe the activity LED and its ~1 Hz blink will indicate that it is automatically and continuously outputting data.

Connecting the 3DM-GX45-45™ 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-GX4-45™ 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® PC using an RS-232 cable;
- the 3DM-GX4-45™ 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

[Free Device Monitoring Studio](#), a communication debugging software, was employed on the PC to observe the serial communication traffic between the PC and the 3DM-GX4-45™ (any such communication software or terminal program will work). The 3DM-GX4-45™, by default, is set baud=115200, data bits=8, stop bits=1, parity control=none, flow control=none. Power was applied to the 3DM-GX4-45™ and the expected 64 byte MIP™ data packets containing Position (LLH), Attitude (Euler RPY), and GPS Time were immediately and continuously received at 25 Hz, as shown below.

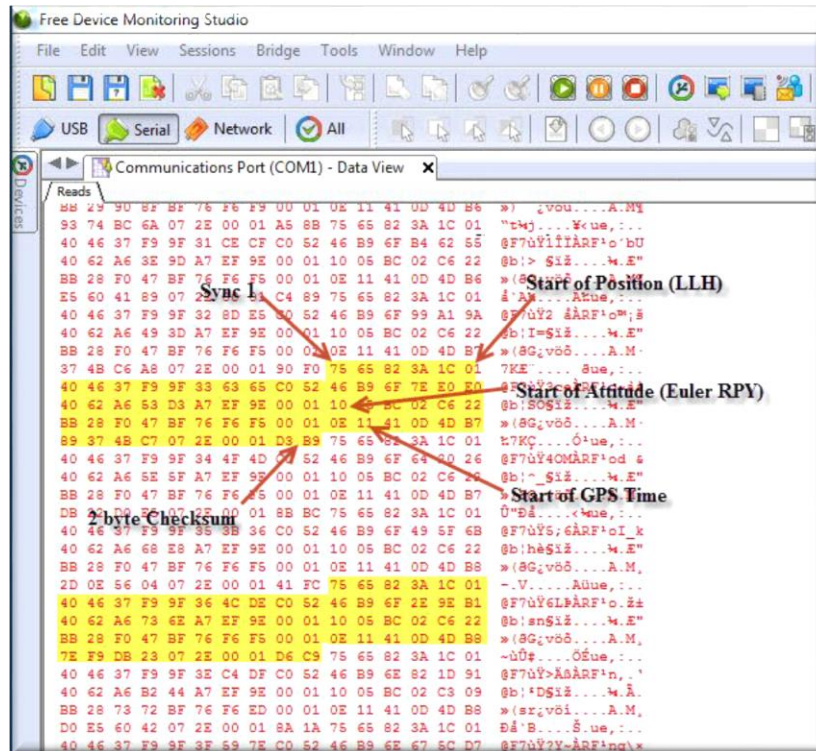


Figure 1. MIP™ Packet as it appears in serial port traffic

MIP™ Monitor software

Testing indicates that MIP™ Monitor software will support the 3DM-GX4-45™ via the Bluetooth® connection. Faster sampling rates and/or larger data packet sizes have been seen to cause drop-outs due to Bluetooth® bandwidth issues, operating system interrupts, timeouts, etc. These potentially may be avoided by programming techniques for those users writing their own applications.

Support

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

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