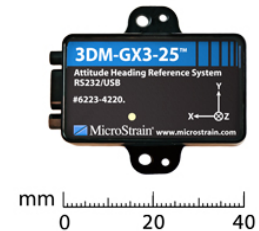


Using the 3DM-GX3[®]-25 with Bluetooth[®] RS-232 Adapters

3DM-GX3[®]-25

Overview

MicroStrain's 3DM-GX3[®]-25 is a high-performance miniature Attitude Heading Reference System, utilizing MEMS sensor technology. It combines a triaxial accelerometer, triaxial gyro, triaxial magnetometer, temperature sensors, and an on-board processor running a sophisticated sensor fusion algorithm to provide static and dynamic orientation, and inertial measurements. It is currently available with RS-232, USB and/or TTL communication interfaces. A wireless communication interface can easily be added by employing various Bluetooth[®] devices.



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[®]-25, provides a wireless orientation sensor package with a very small footprint.



This technical note describes a particular approach to connecting the 3DM-GX3[®]-25 to the Bluetooth[®] serial adapter, establishing communication with a host PC using a terminal program, writing a simple application in Visual Basic, and testing sampling rates. The reader will understand that many other approaches could be taken using different Bluetooth[®] devices, computer hosts including PIC processors and coding languages. This technical note is just one example. Some familiarity with the 3DM-GX3[®]-25 and its data communication protocol is assumed.

Connecting the 3DM-GX3[®]-25 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[®]-25 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 PC using an RS-232 cable;
- the 3DM-GX3[®]-25 was connected to its standard RS-232 communication cable;
- 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 (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. Following the [3DM-GX3[®]-25 data communications protocol](#) for POLLED Euler angles, the single byte hex command CE was sent. As shown in **Figure 1**, the expected 19 byte packet with CE header was returned. Further individual CE commands yield further 19 byte Euler angle packets from the 3DM-GX3[®]-25.

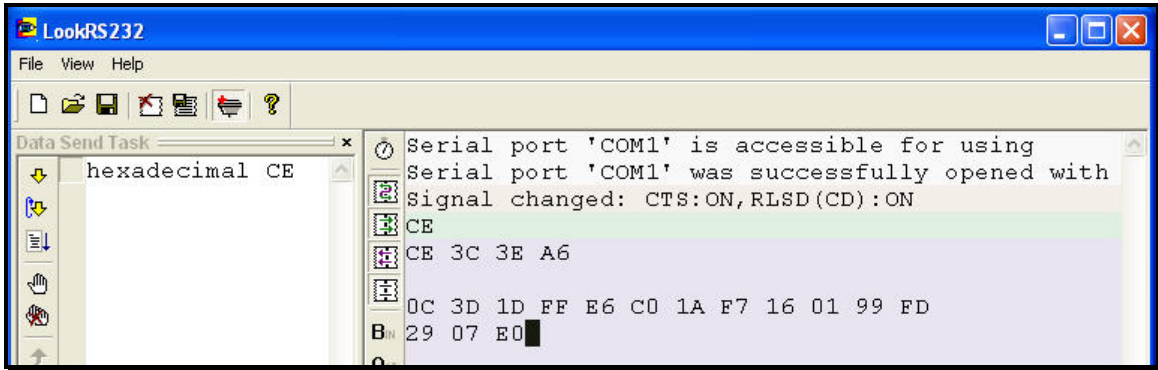


Figure 1

Figure 2 shows the results of issuing the command for CONTINUOUS Euler angles. The 4 byte hex command C4 C1 29 CE was sent and a continuing return of 19 byte Euler angle packets begins.

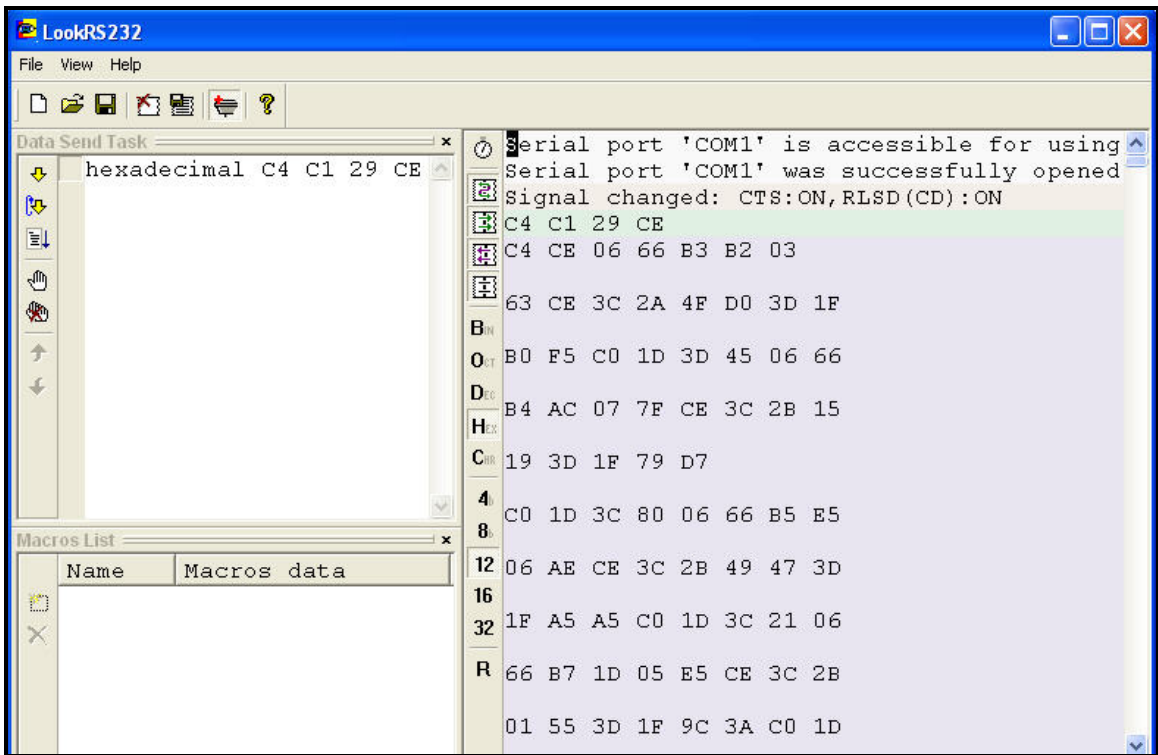


Figure 2

Writing a Simple Visual Basic App and Testing Sampling Rate

A simple application was written in VB6 on a Pentium 4 2.66 GHz which:

- sets the serial port receive threshold at 19 bytes;
- opens serial port 1 at 115200 baud;
- captures the session start time;
- sends the command string C4 C1 29 CE to start continuous Euler angles;
- fires the On_Comm event whenever 19 bytes are received in the serial port InBuffer;
- extracts all the bytes in the buffer;
- parses the bytes for header and checksum, and counts the good packets;
- calculates the pitch, roll and yaw floats, and scales from radians to degrees;
- captures any unused bytes into a remainder buffer (to tack on to the front of the next buffer extract);
- awaits the next On_Comm event;
- captures the session stop time;
- calculates the packets per second.

Prior to starting the tests, the sampling rate of the 3DM-GX3[®]-25 was set to 200 data packets per second, the stated upper limit for sampling Euler angles at 115200 baud rate. Tests were first run to confirm the capability of the software, operating system, baud rate and host PC to handle 200 packets per second on a WIRED connection. In this case the standard 3DM-GX3[®]-25 RS-232 communication and power cable was used. ~200 packets per second were confirmed in repeated testing.

The communication interface between the 3DM-GX3[®]-25 and the host PC was switched to the WIRELESS Bluetooth[®] described above. Using the same software, data packet rates of ~146 packets per second were achieved.

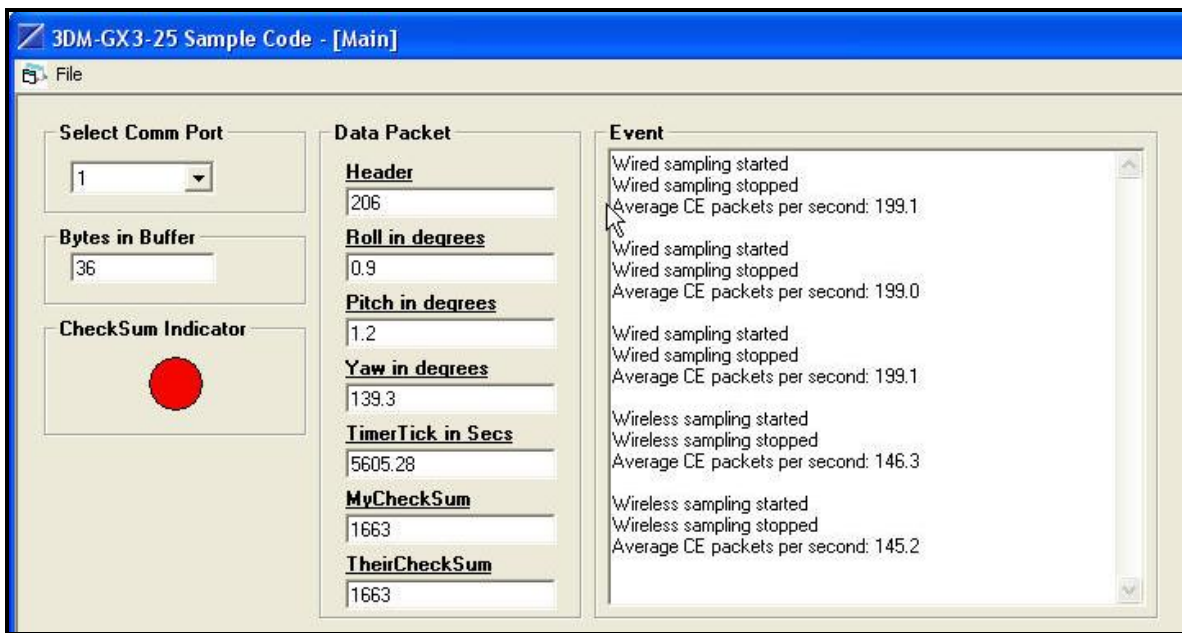


Figure 3

Conclusion

Off-the-shelf Bluetooth[®] serial adapters used with an older host PC operating at 115200 baud produced Euler angle sampling at ~146 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, code and higher baud rates.

Support

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

Rev 1.0
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