IMU & GPS Module Interfacing

IMU and GPS module are enclosed in a single cylindrical package and both modules have direct USB interfacing for on board computer.

The IMU is 9DOF IMU equipped with a 3-axis accelerometer, magnetometer (compass) and gyroscope and work as a USB Inertial Measurement Unit. It get measurement in three different axes making the total of 9 DOF.

The GPS is a high performance positioning engine with direct USB interface. GPS receiver gives output in standard NMEA format with update rate of 1 seconds at 9600 bps. This GPS receiver has onboard battery for memory backup for quicker acquisition of GPS satellites.

"Softwares and Drivers" folder from documentation CD contains software which displays GPS data and provides information such lat, long, UTC, No. of Satellites locked etc.

GPS Interfacing

GPS data can also be received by PC using any serial terminal software. Following steps describe how to get GPS data on serial terminal.

Step 1: Connect USB cable of GPS module to PC.

Step 2: Connecting GPS module to PC will generate a COM Port on PC. Open that COM port in any serial terminal software.

Step 3: Default configuration on serial port (Standard GPS software) is 9600 baud, 8 data bit, no Parity, 1 stop bit, no flow control.

GPS data displayed on serial terminal:

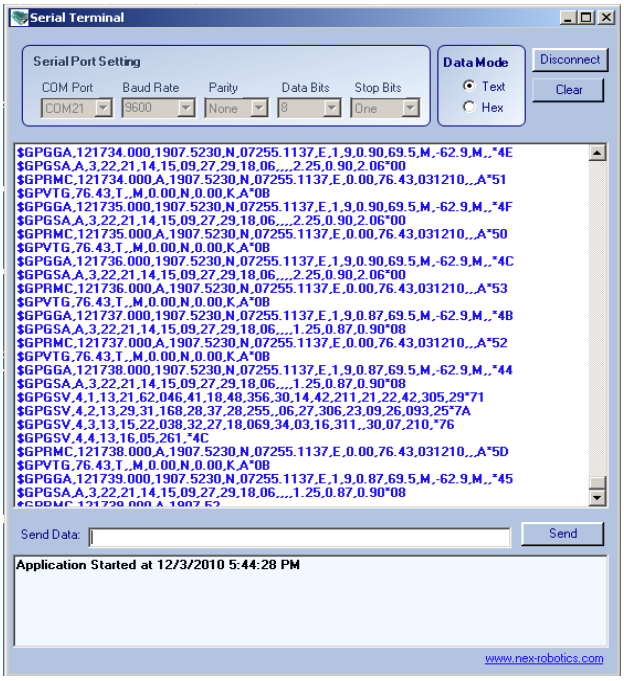

Figure 1: GPS data displayed in serial terminal

when GPS module outside the room and has achieved a lock, you will get correct data in NMEA-0183 format at 9600bps.

IMU Interfacing

9DOF IMU can be directly interfaced with on board PC via USB.

Sensor data notation:
X axis pointing forward
Y axis pointing to the right
Z axis pointing down

Angular data notation:
Positive yaw = clockwise
Positive roll = right wing down
Positive pitch = nose up
Data transformation order: First yaw then pitch then roll

Note: IMU module is factory calibrated and its suggested not to change these calibration settings. However if user still wants to re calibrate the sensors then please refer following link.

http://wiki.ros.org/razor_imu_9dof

Command Set:

Command	Description
#p	Print current calibration values.
#o0	Disable continues streaming output. Also see #f below.
#o1	Enable continues streaming output. Note: It's recommended not to enable continues streaming output. User can send #f command whenever data from IMU sensor is required.
#ob	Output angles in BINARY format (yaw/pitch/roll as binary float, so one output frame is 3*4 = 12 bytes long)
#ot	Output angles in TEXT format (Output frames have form like “#YPR=-142.28,-5.38,33.52”)
#ox	Output angles and linear acceleration and rotational velocity. Angles are in degrees, acceleration is in units of 1.0 = 1/256 G (9.8/256 m/s^2). Rotational velocity is in rad/s^2. (Output frames have form like "#YPRAG=-142.28,-5.38,33.52,0.1,0.1,1.0,0.01,0.01,0.01", followed by carriage return and line feed [\r\n]).
#osct	Output CALIBRATED SENSOR data of all 9 axes in TEXT format. One frame consist of three lines - one for each sensor: acc, mag, gyr.

#osrt	Output RAW SENSOR data of all 9 axes in TEXT format. One frame consist of three lines - one for each sensor: acc, mag, gyr.
#osbt	Output BOTH raw and calibrated SENSOR data of all 9 axes in TEXT format. One frame consist of six lines - like #osrt and #osct combined (first RAW, then CALIBRATED). Note: This is a lot of number-to-text conversion work for the little 8MHz chip on the imu boards. In fact it's too much and an output frame rate of 50Hz can not be maintained. #osbb.
#oscb	Output CALIBRATED SENSOR data of all 9 axes in BINARY format. One frame consist of three 3x3 float values = 36 bytes. Order is: acc x/y/z, mag x/y/z, gyr x/y/z.
#osrb	Output RAW SENSOR data of all 9 axes in BINARY format. One frame consist of three 3x3 float values = 36 bytes. Order is: acc x/y/z, mag x/y/z, gyr x/y/z.
#osbb	Output BOTH raw and calibrated SENSOR data of all 9 axes in BINARY format. One frame consist of 2x36 = 72 bytes - like #osrb and #oscb combined (first RAW, then CALIBRATED).
#oe0	Disable ERROR message output.
#oe1	Enable ERROR message output.
#f	Request one output frame - useful when continuous output is disabled and updates are required in larger intervals only. Though #f only requests one reply, replies are still bound to the internal 20ms (50Hz) time raster. So worst case delay that #f can add is 19.99ms.
Note: Newline characters are not required in front of any command. Byte order of binary output is little-endian: least significant byte comes first.	

IMU data can be received by PC using any serial terminal software. Following steps describe how to get IMU data on serial terminal.

Step 1: Connect USB cable of IMU module to PC.

Step 2: Connecting IMU module to PC via USB cable will generate a COM Port on PC. Open that COM port in any serial terminal software.

Step 3: Default configuration on serial port (Standard GPS software) is 57600 baud, 8 data bit, no Parity, 1 stop bit, no flow control.

Step 4: Send data as "**#ot**" from serial terminal. This will set angular output data in ASCII format.

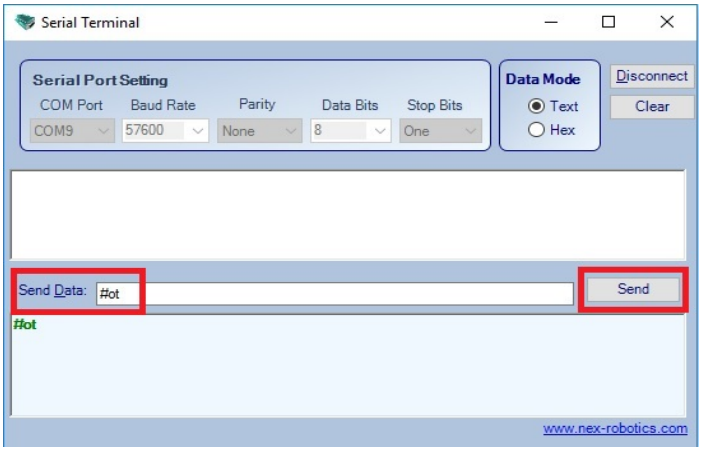

Figure 2

Step 5: Now send "**#f**" to get output data string in reply.

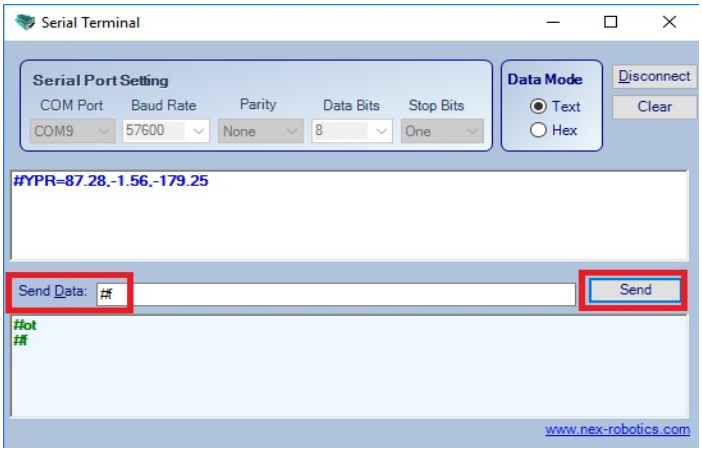

Figure 3

Instead of text output format, you can send "**#ob**" from serial terminal to get binary output data format. And then send "**#f**".