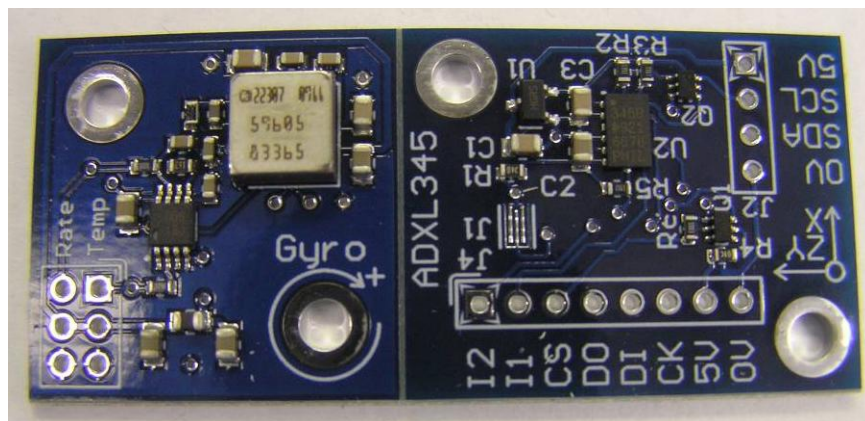# Accelerometer/Gyro Data Sheet
# 2012 *FIRST* Robotics Competition

Accelerometer/Gyro

The sensor board in the 2012 FRC Kit of Parts hosts both an Analog Devices ADXL345 3-axis Digital Accelerometer and an Analog Devices ADW22307 1-axis Analog Gyroscope.

Teams may choose to use the board as is or to separate it along the scored line. Keeping the sensors connected may be helpful in cases where you want to use one to back up the other. For example, the gyroscope is very good at finding rate of angular change, but poor at finding absolute angle. The accelerometer can determine absolute angle when the robot is stable, but is easily confused when the robot moves.

To separate the two sensors, gently and slowly flex the board. Do not attempt to "snap" it, as you may damage the surface mounted components. Gradually increase the applied force until you hear the faint ripping noise of the fibers splitting. It will suddenly "give", at which point you may bend it fully in half. Rub the newly separated edges together over a garbage can to remove any left over debris. Remember to follow proper ESD safety procedure any time you are handling the devices.

The dimensions of the printed circuit board are shown below. Units are mils (thousandths of an inch).
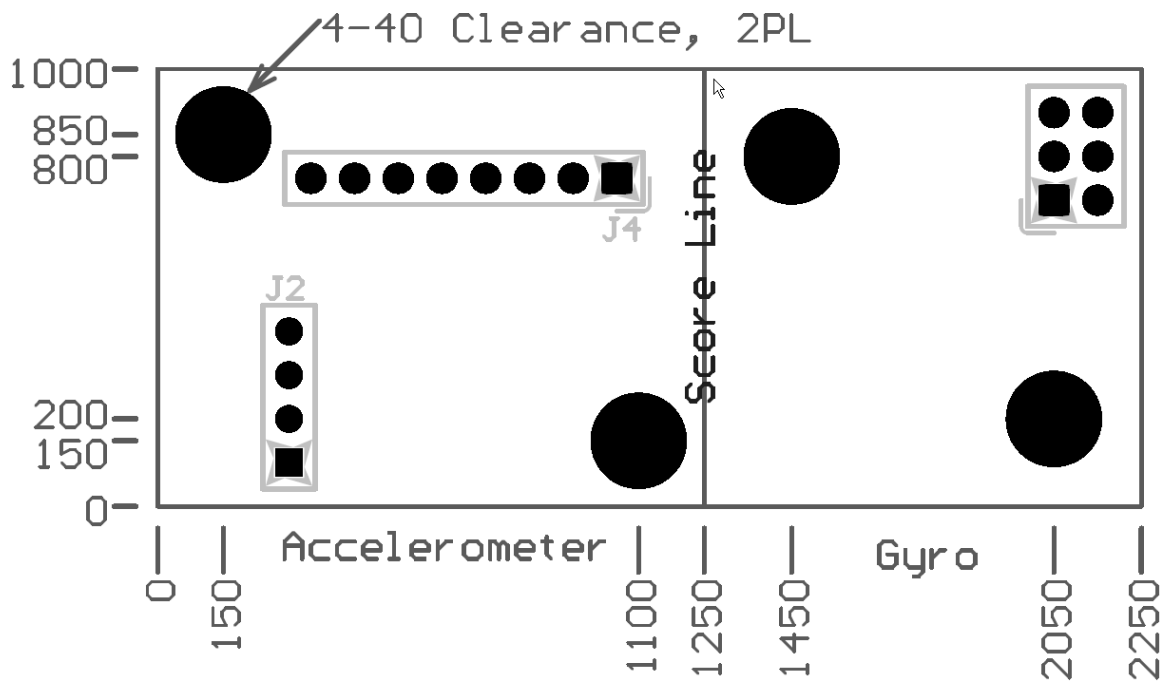
Digital Accelerometer (Analog Devices PN ADXL345)
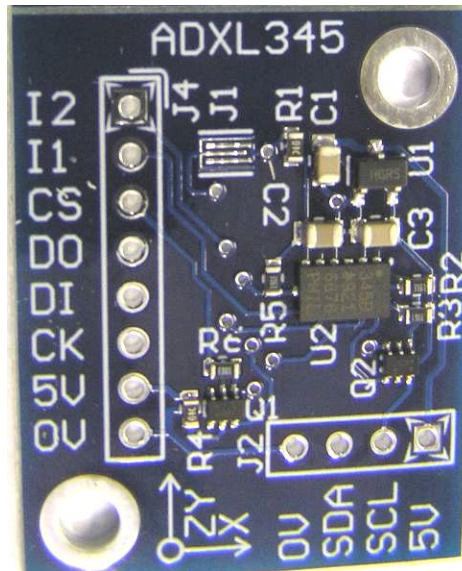
The 3-Axis Accelerometer measures both dynamic acceleration (vibration) and static acceleration (gravity). Accelerometers are sensitive to rough handling. Please remember to handle with care.

The module is designed to permit standoff mounting using 4-40 hardware. Note that plastic fasteners should always be used to isolate the PCB from chassis contact.

This sensor can communicate with the FRC system digitally with either of two protocols: I2C or SPI. The SPI port is found on J4 and was setup to be easily wired to the Digital I/O on the Digital Sidecar. Although the pins can be connected to any GPIOs in any order, it is easiest to use Digital I/O 1-4. Connect 0V and 5V to the (-) and PWR pins that are just beyond Digital I/O 1, and [CK, DI, DO, CS] in order.

The I2C port is found on J2 and was designed to be easily wired to the pins on the Digital Sidecar found directly behind the NXT connector. Connect 5V to 5V, SCL to SCL, SDA to SDA, and (-) to 0V. By default, the I2C address is 0x3A. The address can be set to 0xA6 by shorting J1 with a blob of solder.

Two optional interrupt pins, I1 and I2, are found at the end of the SPI connector but can be used with either I2C or SPI. These pins can be set to alert if the ADXL345 detects a tap (bump) or a fall, or they may be used for some of the advanced flow control functions. Connect one or both of them to any of the Digital I/O on the Digital Sidecar to use these functions.

Please see the code examples included with your software to get started with the ADXL345 once it is wired in. detailed operation of the Analog Devices ADXL345 accelerometer, refer to the Analog Devices website which can be found at http://www.analog.com/.

Note: The ADXL345 starts in a power saving mode. You must turn it on by writing 0x08 to POWER_CTL (0x2D) before it will do anything interesting.

Yaw Rate Gyro (Analog Devices PN ADW22307)
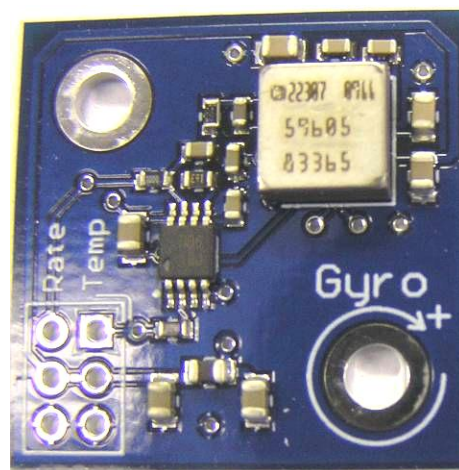
The angular rate sensor (gyroscope) senses angular changes about the top surface axis of the device and provides an output voltage proportional to the angular rate change. The output is useful for guidance,

stability, and control of the robot platform. The lowest apparent drift on the gyro will occur when the module is mounted flat in or near the center axis of the robots rotation.

The module is designed to permit standoff mounting using 4-40 hardware. Note that plastic fasteners should always be used to isolate the PCB from chassis contact.

The ADW22307 can measure up to 250°/s of rotation. Nominal output is 2.5V at standstill, plus 7mV/°/s. The carrier board adds a double pole low-pass filter set to 400Hz: Teams are encouraged to experiment with digital filters in order to select a bandwidth appropriate for their specific usage.

The ADW22307 has an integrated temperature sensor to assist in temperature compensation. Nominal output is 2.5V at 25°C plus 9mV/°C.

Pin-out is as follows, in same orientation as photo above:

Rate	Temperature
+5V	+5V
Ground	Ground

Please refer to the datasheet, which may be found on the *FIRST* Robotics Competition Kit of Parts webpage at www.usfirst.org/frc/kitofparts, for tolerances and other specifications.