



2009 *FIRST* Robotics Competition

Sensor Manual

The 2009 *FIRST* Robotics Competition (FRC) sensors are outlined in this document. It is being provided as a courtesy, and therefore does not supersede any information or rules provided in the 2009 *FIRST* Robotics Competition Manual.

Small, Low Power, 3-Axis ± 3 g Accelerometer (Analog Devices PN ADXL335)



The 3-Axis Accelerometer measures both dynamic motion (vibration) and static motion (gravity). Accelerometers are sensitive to rough handling. Please remember to handle with care.

To use this sensor with your new control system, connect the outputs for the axes you wish to measure (X_{out} , Y_{out} , Z_{out} , or a combination of the three) to the analog input pins on your Analog Breakout. You can solder RC Extension cables to the board to transmit signal, 5V supply, and ground. Alternatively, you may create your own wiring harness using 22AWG wire.

The circuit card assembly is designed to permit standoff mounting using appropriate hardware. Note that plastic hardware should be used to isolate the PCB from chassis contact. There are 4-40 clearance holes at (0.200",0.800") and (0.800",0.200"). The board is 1"x1".

The performance specifications are all included in the data sheet posted on the Analog Devices website at www.analog.com. Please note that while the Analog Breakout supplies 5V to the board, the circuit card assembly steps the supply voltage to the ADXL335 down to 3V. Please see the schematic for further details.

The orientation of the chip is indicated by the silkscreen on the circuit card assembly.

The ADXL335 can measure $\pm 3g$ in each axis. Nominal output is 1.5V at 0g (free-fall), plus 300mV/g. Each axis has a single pole low-pass filter set to 225Hz: Teams are encouraged to experiment with digital filters in order to select a bandwidth appropriate for their specific usage.

For detailed operation of the Analog Devices [ADXL335](http://www.analog.com) accelerometer, refer to the [datasheet](http://www.analog.com) which can be found on the Analog Devices website at www.analog.com. Please refer to the datasheet for tolerances and other specs.

Yaw Rate Gyro (Analog Devices PN AD22305)



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 PCB modules are designed to permit standoff mounting using appropriate hardware. Note that plastic fasteners should always be used to isolate the PCB from chassis contact. The mounting footprint is the same for both the gyro and the accelerometer carrier boards.

The AD22305 can measure up to $250^\circ/\text{s}$ of rotation. Nominal output is 2.5V at standstill, plus $7\text{mV}/^\circ/\text{s}$. 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 AD22305 has an integrated temperature sensor to assist in temperature compensation. Nominal output is 2.5V at 25°C plus $9\text{mV}/^\circ\text{C}$.

The datasheet is not available online, but is attached to this document for reference. Please refer to the datasheet for tolerances and other specs.