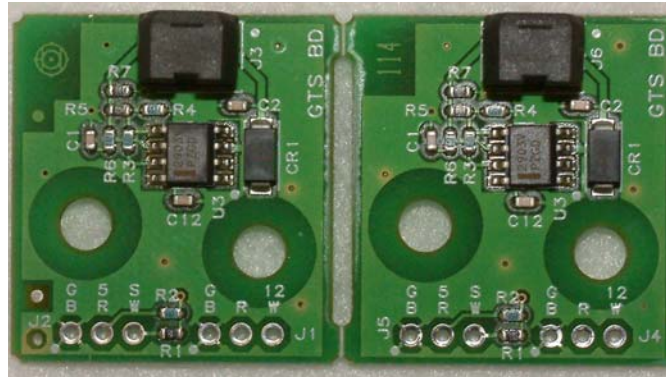# 2007 *FIRST* Robotics
Sensor Manual

The 2007 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 2007 FIRST Robotics Competition Manual.

Differential Peak-Detecting Gear Tooth Sensor

Allegro Microsystems PN ATS642LSH

The Gear Tooth Sensors (GTS) should be wired to the Robot Controller's (RC) digital interrupt inputs.The boards require both a +12 volts supply and a +5 volt supply, which is labeled on the boards. The current draw for these sensors is relatively low at 16mA.

For detailed operation of the Allegro MicroSystems ATS642LSH Differential Peak-Detecting Gear Tooth Sensor, refer to Allegro Microsystems' website at www.allegromicro.com.

A ferrous metal rotating gear (or sprocket, etc) will provide a pulse as each tooth passes. The duty cycle of the signal ranges from 41% to 61%. The pulse with is the same for clockwise and counterclockwise rotations.

Dual-Axis Accelerometer

Analog Devices PN ADXL311

The Dual-Axis Accelerometer (DAA) should be connected to two of the RC analog inputs to measure X-axis and Y-axis acceleration. It will also detect the acceleration due to gravity, and can therefore be used as a static orientation sensor.

The output varies by 290 mV/g, when given a 5.0-volt supply. The current draw is 3mA.

For detailed operation of the Analog Devices ADXL311 DAA, refer to the Analog Devices website which can be found at www.analog.com.

Board orientation	White dot by U5	X output (volts)	Y output (volts)
Horizontal	Don't care	2.5	2.5
Vertical	Upper left	2.2	2.5
Vertical	Lower left	2.5	2.8
Vertical	Lower right	2.8	2.5
Vertical	Upper right	2.5	2.2

All of the voltages assume the DAA is stationary.

Yaw Rate Gyro
Analog Devices PN ADXRS150

The Yaw Rate Gyro (YRG) should be connected to two of the RC analog inputs. Please note that the output labeled "T" is for "Twist" or rotational velocity. The output labeled "R" is "Relative Temperature". For detailed operation of the Analog Devices ADXRS150 YRG, refer to the www.analog.com website.

The actual Yaw Rate Gyro chip that was used in 2006 was the AD22304. It had a guaranteed dynamic range of +/- 80 degrees per second vs. the +/- 150 degrees per second for the ADXRS150. Most other specifications are identical.

The "T" output varies by 12.5 millivolts per degrees per second of rotation. No rotation will give a 2.5-volt output. The current draw is 8mA. Accelerating clockwise will provide a voltage above 2.5 volts. The 3 dB bandwidth of the Yaw Rate Gyro is set at 40 Hz.

The "R" output varies by 8.4 millivolts per degree Kelvin. A temperature of 298 K (about 25 Celsius) will give an analog output of 2.5 volts. Higher temperatures will provide higher voltages. Cooler temperatures will provide lower voltages.