

# Dual Use Gyro and Accelerometer Sensor Board

This sensor board includes a digital accelerometer and an analog gyroscope. The two boards are connected, but can be split apart by the user, if needed. Analog Devices sensors are used on the boards.

- Analog Devices ADXL345 3-axis Digital Accelerometer (details on page 2)
- Analog Devices ADW22307 1-axis Analog Gyroscope (details on page 3)

The AndyMark part number for this sensor board pair is “am-2067”. These sensors can only be purchased in a pair, on this web page:

<http://www.andymark.com/product-p/am-2067.htm>

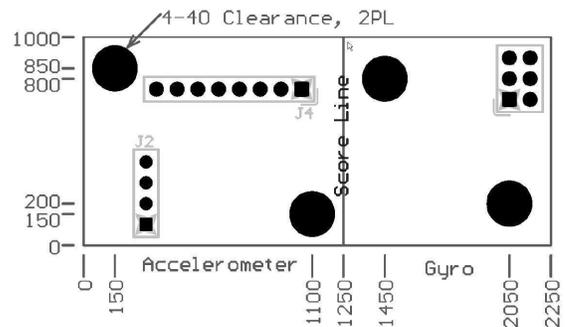
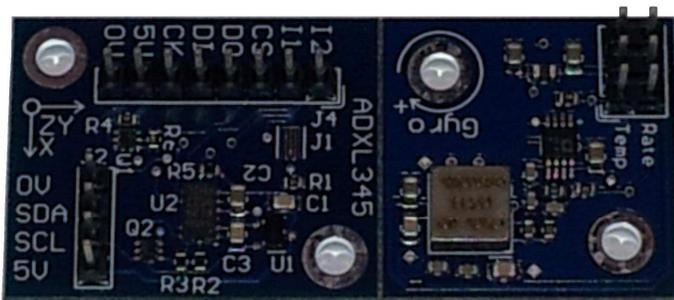
## Good Teamwork

The sensors work well, even while still connected. During many applications, users use one sensor to back up the other. For example, the accelerometer is good at determining absolute angle, but not so good at this when the robot is moving. Also, the gyroscope is good at determining angular rate of change, but not good at finding an absolute angle.

## Used Individually

During some applications, the user may need to split apart these two sensors. Before you separate these two boards, make sure you follow proper ESD procedures so the boards aren't zapped. To do this, gently flex the board but don't “snap” it, as damage to the surface mounted components can occur. Carefully increase your flexing force until you can feel and hear the circuit board fibers giving way. The board will eventually split, when it will easily bend in half. The raw edges will be rough, but can be smoothed out by rubbing a metal edge over them.

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 dynamic acceleration (vibration) and static acceleration (gravity). Please handle this sensor with care, as it is sensitive.

## Mounting

Clearance holes for a #4 screw are present on the board. We recommend plastic screws for electrically isolating the board from a metal mounting plate. Also, it may be wise to use a shock-absorbing pad or grommet to isolate signals to the board.

## Communication

This sensor can communicate with a control system using the Digital Sidecar digitally by either of two protocols:

- SPI: This is on J4 and can be 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.
- I2C: This port is on J2 and can be 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.

The Analog Devices website has operation instructions and code examples, useful once the ADXL345 is wire up. Check out <http://www.analog.com/> for more information.

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) detects angular changes about the board's top surface axis. The output is a voltage proportional to the angular rate change. The user can read this information for guidance, stability, and control of the robot platform. The most accurate reading from this gyro will take place if it is mounted flat in or near the center axis of the robots rotation.

## Mounting

Clearance holes for a #4 screw are present on the board. We recommend plastic screws for electrically isolating the board from a metal mounting plate. Also, it may be wise to use a shock-absorbing pad or grommet to isolate signals to the board.

## Usage

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. Users can 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 9 mV/°C.

## Communication and Pinout

Rate	+5V	Ground
Temp	+5V	Ground