

## TARS-IMU Sensors for Active Suspension

### An Application Note

#### Background

With off-road wheeled and track equipment, it is common to be operating the equipment on sloped or uneven terrain. This type of equipment is typical to the agriculture, construction, oil and gas, and defense industries. As a result of operating on uneven or sloped terrain, the operator may also be in an undesirable position for extended periods. In addition to the optimal position for the operator of the equipment, there may also be portions of the equipment such as engine management or hydraulics that should be compensated while on sloped terrain.

#### Solution

To overcome the issues of the equipment tilted related to the terrain, Honeywell offers the TARS-IMU (Transportation Attitude Reference Sensor – Inertial Measurement Unit) sensor. The TARS-IMU sensor can be integrated into the equipment to provide real time feedback, compensating for the uneven or sloped terrain.

The Honeywell Transportation Attitude Reference System, or TARS-IMU, is a packaged sensor array designed to report vehicle angular rate, acceleration, and attitude data for demanding applications in industries such as heavy-duty, off-highway transportation.

TARS-IMU enables autonomous vehicle characteristics and enhances efficiency and productivity by reporting key data required to automate and monitor movements of vehicle systems and components. The sensor fusion algorithm can be customized for specific vehicle applications through on-board firmware, allowing movement data to be filtered for extraneous environment and vehicle movements.

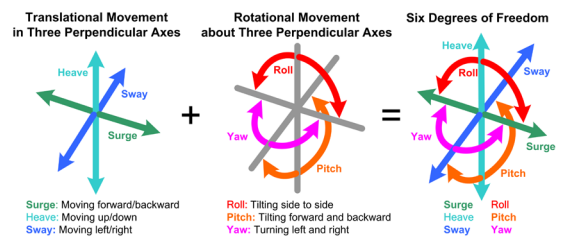
In Figure 2, the left diagram indicated the TARS sensor measures the equipment is on level ground, and input from the sensor indicates no change to the equipment inclination. In the middle diagram, feedback from the sensor starts to indicate that vehicle is experiencing some tilting as it rolls over uneven ground. In the last image (right diagram), the vehicle ECU/controller has processed the output from the TARS and corrected for tilt by adjusting suspension to keep the equipment level. Not shown here, but this same type of signal output could be implemented on machines to help prevent a rollover situation.



#### Features and Benefits

- Enhanced performance from IMU offers reporting of vehicle angular rate, acceleration and inclination (6 degrees of freedom)
- Ruggedized PBT thermoplastic housing design enables it to be used in many demanding applications and environments (IP67- and IP69K-certified)
- Advanced filtering of raw sensor data to minimize unwanted noise and vibrations, improving positioning accuracy
- Optional metal guard for added protection
- Supports 5 V and 9 V to 36 V vehicle power systems
- Operating temperature of -40°C to 85°C [-40°F to 185°F]
- Reduced power consumption
- Small form factor

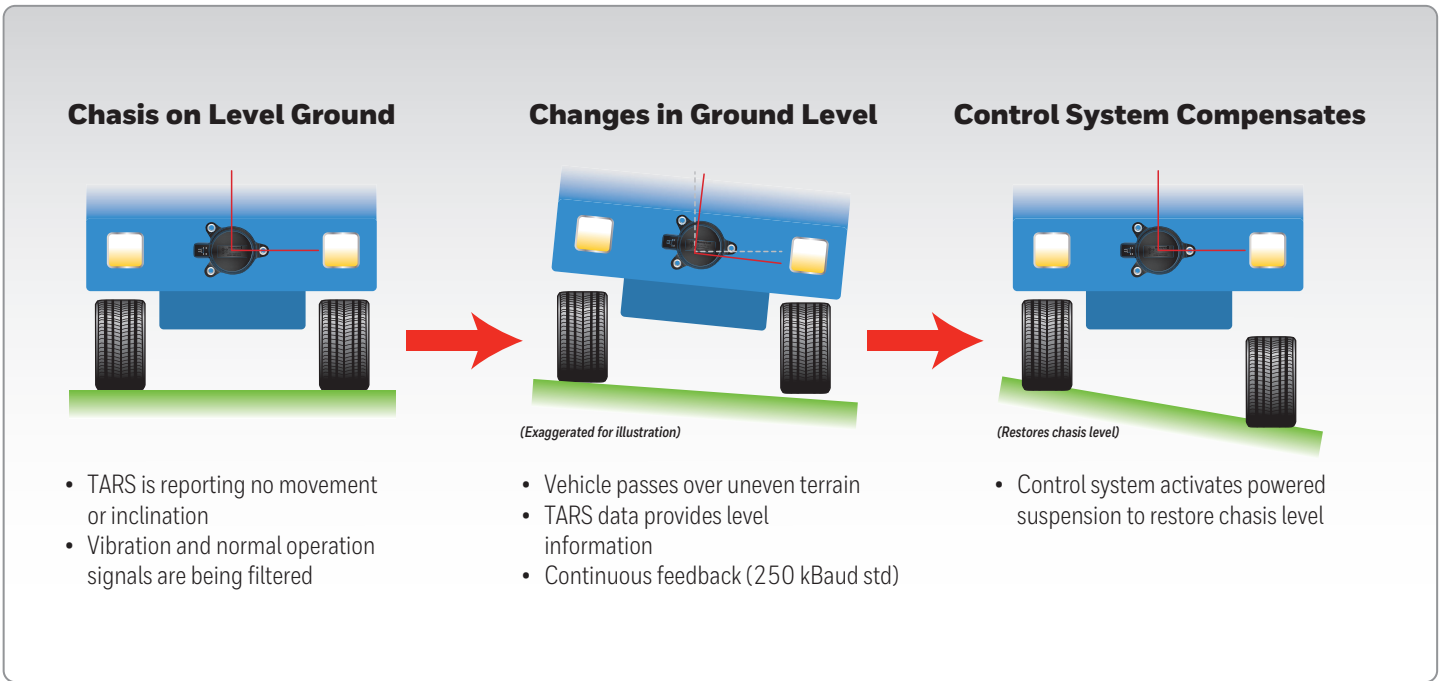
Figure 1. TARS Six Degrees of Freedom



This assistance will be found more often as the industry moves toward some fully autonomous systems. TARS-IMU is a key piece as it provides and reports key vehicle data. With six degrees of freedom, TARS-IMU reports the key movement data such as angular rate, acceleration, and inclination. Furthermore, TARS-IMU is equipped with customizable data filters; it can be tuned to reduce extraneous noise and vibration that would otherwise distort the valuable data.

The TARS-IMU utilizes a robust packaging design (IP67/IP69K) that makes it more resilient to the rigors of the construction industry. In addition, a wide operating temperature range of -40 °C to 85 °C makes it ready for use in many demanding tool and implement applications.

**Figure 2. Honeywell TARS-IMU in an Active Suspension Application**



**⚠️ WARNING**  
**IMPROPER INSTALLATION**

- Consult with local safety agencies and their requirements when designing a machine control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

**Failure to comply with these instructions could result in death or serious injury.**

**Warranty/Remedy**

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