Mag566 used in Vehicle Navigation Systems

Objectives

To supply orientation information to guidance systems by measuring the direction of the Earth's magnetic field.

Instrumentation

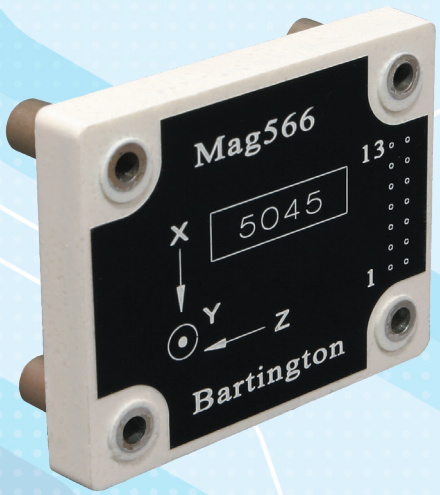
- Mag566 low power three axis fluxgate magnetometer.

Applications

- Navigation systems on unmanned vehicles.

Background

Unmanned vehicles, such as those used for bomb disposal or for searching through buildings or wreckage, are often operated out of sight of the operator. Having information on the orientation of the vehicle therefore becomes important.



GPS systems can be used for vehicle navigation, but if the operation is being carried out within a building or cave then a satellite connection cannot be achieved and the user must get navigation information by other means. Magnetic field sensors can be used to act as a compass to provide heading information. The direction of the Earth's magnetic field can be calculated from the displacement angles from two horizontal axes of the magnetic field sensor, thus providing a direction for North. As the Earth's magnetic field can be measured through rock and inside buildings, it can be used in areas where GPS systems cannot.

The magnetic field sensors in the vehicle will operate alongside other sensors such as accelerometers to provide movement information, all of which can be transmitted back to the operator.

Method

The Mag566 is well suited for integration into systems like unmanned vehicles. Its compact, lightweight design, combined with its low power consumption of 20mW, enables it to be fitted to small vehicles where weight and battery life are at a premium.

The Mag566 should be kept horizontal in order for it to read the direction of magnetic north. The sensor is mounted in a non-magnetic gimbal to isolate it from any pitch or roll in the vehicle's movement. This allows it to remain horizontal but still to remain fixed in the direction that the vehicle is facing.

The direction of magnetic North is calculated from the two horizontal axes. The readout from each axis equates to $B\cos\theta$, where θ is the angular displacement of that axis away from the field direction and B is the total field intensity.

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The field measurements can be processed to give a compass direction or an angular displacement from North by an onboard computer before transmission to the operator, either wirelessly or via a tether.

It will be important to measure and compensate for the magnetic signature of the vehicle as it will affect the reading of the Earth's magnetic field. The Mag566 has a small (0-30Hz) frequency response, so provides good rejection of higher frequency fields from, for example, motors, but the static component of the vehicle's signature will have to be calibrated out computationally.