



Watson Industries Application Notes

Airborne Spectral Ground Survey

Surveys of ground locations using spectral analysis are used to analyze agricultural conditions for a wide variety of purposes. Analysis of the survey data can provide information on the amounts of insecticide, herbicide, fertilizer, and irrigation necessary for the area. This allows these resources to be used more efficiently in the area creating a higher yield at a lower cost.



Aerial photography of a ground location requires precision location of the aircraft and the exact pointing angle of the camera with respect to the ground. This means that a highly accurate gyro is required that can maintain this accuracy even in highly dynamic conditions.

Watson Industries manufactures the Attitude and Heading Reference System (AHRS) for this application. The AHRS has the quality gyros and data processing algorithms to output a highly accurate pointing angle for airborne surveys.

Technical Challenges:

When a camera is mounted in an aircraft that is continually circling a location, bank errors due to centrifugal force will build up in the system. To correct this problem, a velocity input to the Attitude and Heading Reference System is required. The velocity data is used with the turn rate to calculate the centrifugal force and remove its effects from the system. Velocity is normally transmitted to the AHRS via an analog voltage, but we have options available for the sensor to receive velocity digitally as well.

The heading output for the AHRS-E304 is referenced to the magnetic heading provided by an internal magnetic compass. This means that any extraneous magnetic fields in the vicinity will induce heading errors. Installation in an aircraft can be difficult because of the magnetic environment. Aircraft can have steady state magnetic fields of over 400 milliGauss. Considering that the Earth's field is only about 650 milliGauss, considerable heading errors can result. These vehicles also have motors, relays, batteries and high current carrying conductors that create highly variable magnetic fields that can induce heading errors. Finding a mounting location that is magnetically clean is key to solving this issue.



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Watson Experience:

Watson Industries been involved in the development and production of these products with several companies since 1985.

Requirements:

- Pointing accuracy: 0.25° Bank, 2° Heading
- Airspeed Input – The possibility of sustained dynamic maneuvers requires airspeed be read into the sensor to allow calculation of and correction for those dynamics. The standard input format is an analog voltage. A digital airspeed signal from GPS or another source is available as a custom option.

Applicable Products:

- AHRS-E304
- DMS-E604/205 (DMS with GPS option)

Typical Options:

We are able to accommodate your custom needs. Shown below is a listing of our most common custom modifications.

- Digital velocity input – Watson can support digital velocity inputs in many formats such as GPS and Airspeed Indicators.
- External GPS reference – We have built custom units that utilize GPS data as a velocity and / or heading reference.
- Custom specifications – For certain applications, customers require specifications that are different from our standard units. Watson Industries engineering is willing and able to accommodate these needs.
- Input Voltage – Many different input voltages can be accommodated.
- Output Format – Communications Protocols RS-232, RS-485, RS-422, USB, ARINC, Syncro.
- Data Format – We have made many products with custom formatted data outputs.
- Sensor Ranges – The ranges for most of our sensors can be expanded or reduced to meet your requirements. Some of our gyros can have ranges of up to $\pm 3000^\circ/\text{sec}$.



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