

# AHRS

## ATTITUDE & HEADING REFERENCE SYSTEM

- ▼ Roll, Pitch and Heading Angle in Dynamic Environments
- ▼ Enhanced Performance Kalman Filter Algorithm
- ▼ No External "Aiding" Required
- ▼ Designed to Meet FAA TSO C4c and TSO C6d Requirements
- ▼ Avionics-style Enclosure Designed to DO160D Requirements
- ▼ Continuous BIT (Built-in Test)



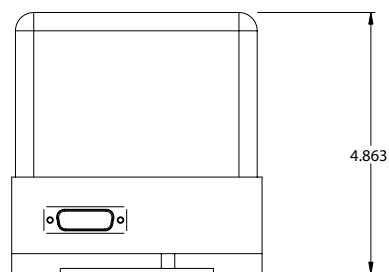
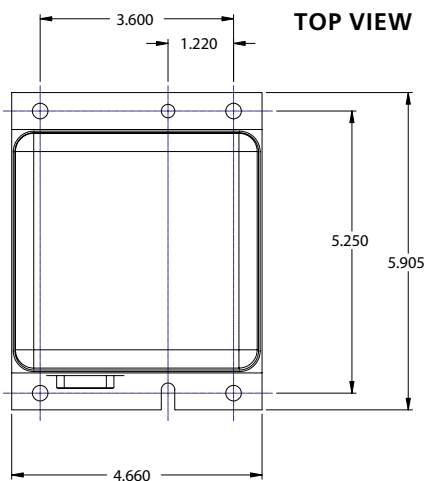
## AHRS500CA

The Crossbow AHRS500CA is a high performance, solid-state attitude and heading reference system intended for aviation applications. This high reliability, strap-down inertial system provides attitude and heading measurement with static and dynamic accuracy superior to traditional spinning mass vertical and directional gyros.

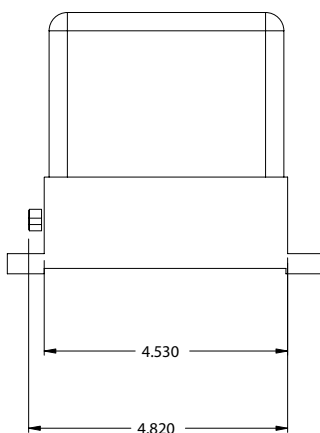
The AHRS500CA features high performance solid-state MEMS gyros and accelerometers and achieves its excellent performance by employing proprietary Kalman Filter algorithms to determine stabilized roll, pitch, and heading angles in static and dynamic conditions. The Kalman Filter implementation results in a continuous on-line gyro bias calibration, and an adaptive attitude and heading measurement that is

stabilized by the long term gravity and magnetic north references. No external aiding is required. Output data is provided on a digital RS-232 or RS-422 serial data bus.

The AHRS500CA is designed to meet all FAA requirements for FAR 23 class 1, 2, and 3 aircraft. A sophisticated suspension system, similar to those found on commercial air transport navigation systems, ensures full performance in aircraft vibration environments. A sealed enclosure ensures long trouble-free life and full performance over full altitude and temperature range without risk of moisture contamination. A comprehensive Built-in-Test (BIT) monitors all sensors and internal electronics continuously during operation and sends a system status update in every output message.



SIDE VIEWS



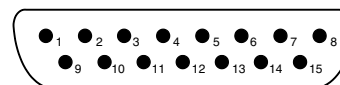
inertial systems

| Specifications                 | AHR500CA-200           | Remarks                     |
|--------------------------------|------------------------|-----------------------------|
| <b>Performance</b>             |                        |                             |
| Update Rate (Hz)               | 100                    |                             |
| Start-up Time                  |                        |                             |
| Valid Data (sec)               | < 1                    |                             |
| Full Accuracy Data (sec)       | < 60                   |                             |
| <b>Heading</b>                 |                        | FAA TSO C6d Test Conditions |
| Range (°)                      | 0 to 360               |                             |
| Accuracy (°)                   | ± 2                    |                             |
| Resolution (°)                 | 0.1                    |                             |
| <b>Attitude</b>                |                        | FAA TSO C4c Test Conditions |
| Roll Range (°)                 | ± 180                  |                             |
| Pitch Range (°)                | ± 180                  |                             |
| Accuracy (°)                   | ± 2.5                  |                             |
| Verticality (°)                | < 1.0                  |                             |
| Resolution (°)                 | 0.1                    |                             |
| <b>Environment</b>             |                        | FAA DO160D Test Conditions  |
| Operating Temperature (°C)     | -40 to +70             |                             |
| Non-Operating Temperature (°C) | -55 to +85             |                             |
| Operating Vibration (g rms)    | DO160D, Curve M        |                             |
| EMI                            | DO160D, Category R     |                             |
| Waterproof/Humidity            | Sealed Housing         |                             |
| Altitude (ft)                  | 35,000                 |                             |
| Maximum Angular Rate (°/sec)   | 200                    | Roll, Pitch, or Yaw         |
| Maximum G Range (G)            | 10                     |                             |
| <b>Electrical</b>              |                        |                             |
| Input Supply Voltage (VDC)     | 10 to 35               |                             |
| Input Power (W)                | < 4                    | @ 12 VDC                    |
| Digital Output Format          | RS-232                 | RS-422 Available            |
| <b>Physical</b>                |                        |                             |
| Size (in)                      | 4.7 x 4.5 x 4.9        | Excludes Mounting Flanges   |
| Connector                      | 15 Pin Sub-Min DB Male |                             |

## Notes

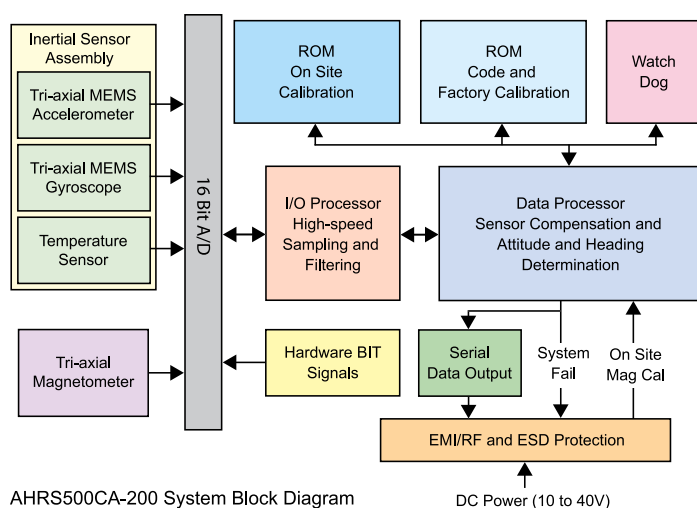
Specifications subject to change without notice

15 Pin "D" Connector Male Pinout



| Pin | Signal                                          |
|-----|-------------------------------------------------|
| 1   | RS-232 Transmit                                 |
| 2   | RS-232 Receive                                  |
| 3   | 10-35 VDC Power Input                           |
| 4   | Power Input Ground                              |
| 5   | No Connection (Factory use only)                |
| 6   | No Connection (Factory use only)                |
| 7   | RS-422 Transmit + A (Optional)                  |
| 8   | RS-422 Transmit - A (Optional)                  |
| 9   | Signal Ground                                   |
| 10  | No Connection (Factory use only)                |
| 11  | No Connection (Factory use only)                |
| 12  | Magnetometer Cal Input (Hard and soft iron cal) |
| 13  | Hardware BIT Status                             |
| 14  | RS-422 Receive + A (Factory use only)           |
| 15  | RS-422 Receive - A (Factory use only)           |

Pin Diagram



AHR500CA-200 System Block Diagram

| Hardware Test              | Power On BIT | Operation BIT |
|----------------------------|--------------|---------------|
| Power Supply Voltage       | Y            | Y             |
| RAM Memory Integrity       | Y            | N             |
| ROM Memory Integrity       | Y            | N             |
| Processor(s) Integrity     | Y            | Y             |
| ADC Integrity              | Y            | Y             |
| Gyro(s) Integrity          | Y            | Y             |
| Accelerometer(s) Integrity | Y            | Y             |
| Temp Sensor Integrity      | Y            | Y             |
| Sensor Temperature         | Y            | Y             |
| Magnetometer(s) Integrity  | Y            | Y             |

Bit Tests Performed

## Ordering Information

| Model        | Description            |
|--------------|------------------------|
| AHR500CA-200 | Avionics AHR5 Solution |

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