



Advance Motion Measurement, Inc.

'Applying Biomechanics to Achieve Peak Performance'



AmmSensor™ With **AmmGraph3D™** for **Life Science Research Applications**



AmmSensor™ is a revolutionary new real-time wireless 3D sensor that is Bluetooth enabled. This 3D (6DOF) inertial measurement unit (IMU) samples at 250Hz and provides motion data by employing three miniature tri-axial MEMS chips to capture acceleration, the earth's magnetic vector and angular velocity. **AmmSensor™** combined with **AmmGraph3D™** software will capture and display both the raw sensor signals:

- acceleration (Ax, Ay, Az),
- magnetic field (Mx, My, Mz),
- gyroscope (Gx, Gy, Gz)

And the orientation unit vectors:

- X-Axis (Xx, Xy, Xz)
- Y-Axis (Yx, Yy, Yz)
- Z-Axis (Zx, Zy, Zz)



An advanced Kalman filter is used in this process to obtain the most accurate orientation results possible.

The **AmmSensor™** has a superior technical performance specification: (www.AmmSensor.com)

- Fast sampling rate of 250Hz.
- Rotational velocity switchable in two ranges; up to 400 degrees/sec for slower motions and up to 2,000 degrees/sec for faster motions such as a golf swing or throwing.
- Accelerations are also switchable in two ranges $\pm 4g$ s and $\pm 12g$ s.
- It's small: 2.75" x 1.7" x 0.7" / 68 x 43 x 18mm, light: 1.5 oz / 42g and inexpensive!
- A sensor unit is self-contained with an internal rechargeable battery, which gives it up to eight hours of life.
- It communicates and transmits 3D motion data to a laptop via Bluetooth technology; this also means you could even write your own software for a Windows Mobile, iPhone or Droid smart phone to provide the ultimate in portability.
- More technical details at: <http://www.ammsensor.com/TechnicalInfo/AMG1Specification.aspx>

AmmSensor™ is the most versatile, lowest cost Bluetooth enabled IMU/sensor in the world today! It can measure human motion, machine motion or any motion! **AmmSensor™** has been designed for high speed sports motion (2000d/s and 12g) but can easily be switched to measure slower motion for rehabilitation applications (400d/s and -4g). The attractive slim line package can easily be worn on the wrist, leg, around the waist or on any part of the body!

AmmSensor™ can be used in many life science areas and in a myriad of industrial applications: • Biomechanics Research • Motor Control • Rehabilitation • Biomedical Engineering • Sports • Physical Therapy • Psychology • Neurology • Educational Demonstrations, e.g. Physics Classes. Also in: • Aging • Slip and Fall • Gait • VR • Forensic Medicine • Augmented Reality • 3D Simulation Training • Gaming Industry • Ergonomics • Aerospace • Automotive • Marine • Military.

AmmSensor's output can be changed between binary and ASCII by the user. Binary mode provides 250 complete samples per second, whereas ASCII output is 125 samples per second, and is intended for ease-of-use with any terminal program that can receive 115 Kbaud data. The software also computes unit vectors of the sensor's orientation. From

these unit vectors many different 3D angle sets can be computed; such as Euler angles, Cardan Angles etc. These data are transmitted from the *AmmSensor™* in real-time to a Windows compatible laptop. *AmmGraph3D™* allows for capture to a comma delimited file, which opens MS Excel to display and save the current data. The real-time aspect of the *AmmSensor™* allows it to be used as a biofeedback training tool (e.g. *AmmTrainer3D™* – see www.amm3d.com of more details). Motion biofeedback or motion data logging applications allow *AmmSensor™* to be attached to a segment of the body and be used in sports, rehabilitation and other fields.



Place one *AmmSensor™* on the tibia and one *AmmSensor* on the foot to measure dorsiflexion and plantarflexion.

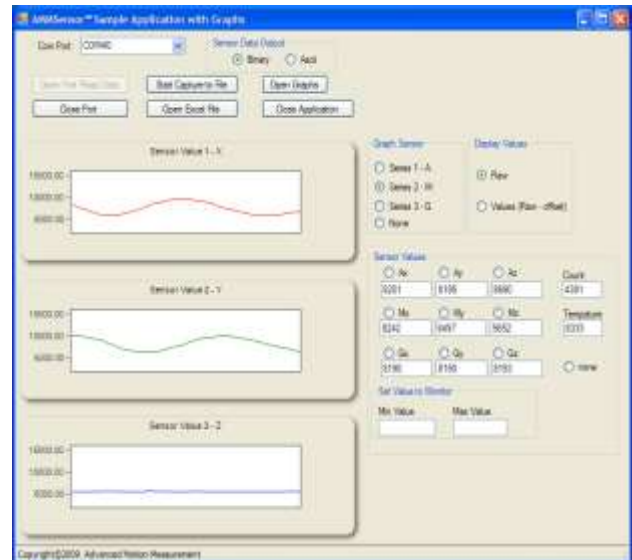
To write your own programs in most languages: VB, C#, C, Matlab and Labview, you can use a simple software demonstration program in VB that we provide. Since the *AmmSensor™* uses Bluetooth you could even develop programs of your own for Windows Mobile, iPhone or Droid smart phones. This allows for ultimate portability.

AmmGraph3D™

Displaying the AmmGraph3D™ Data

After the *AmmSensor™* is turned on, the user chooses the serial port number and clicks 'Open Port' and 'Read Data'. Now real-time data will be streaming on the screen and the values will be rapidly changing. The magnetometer, accelerometer or gyroscope can be chosen to graph by clicking the appropriate button. The user will see the three graphs changing when the *AmmSensor™* is moved.

Once connected the software displays the data values per sensor from all nine sensor channels in real-time; this could be the raw sensors data (acceleration, magnetic field, angular velocity) or all 9 unit vectors (orientation). The main screen is shown below.



Graphing and Displaying All Channels

To graph all 9 channels of data the user clicks 'Start Capture', moves the sensor then clicks 'Stop Capture' (the same button). 'Open Graphs' now shows in the adjacent screen.

These data are automatically saved to a comma delimited data file which can be read into Excel by clicking 'Open Excel'.

To purchase **AmmSensor™** go to 'Store' at www.AmmSensor.com - **AmmGraph3D™** go to 'Store' at www.amm3d.com

For more information call Stephen Cheetham (602) 263-8657