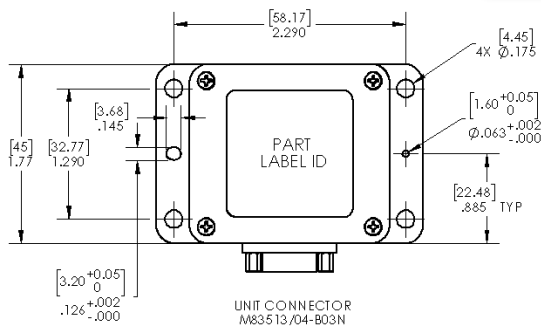
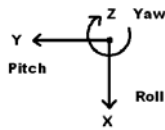


# LandMark™ 60 IMU

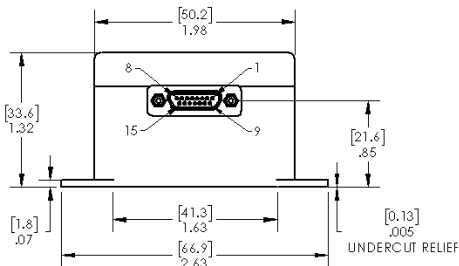


Axes (Top View)  
Right Hand Rule



## LMRK60 IMU

LMRK60IMU-250-06-100 or -15  
LMRK60IMU-490-06-100 or -15



Mating Connector: M83513/03-BN

| Pin No. | Assignment                      |
|---------|---------------------------------|
| 1       | RS-485 A (+) (Twisted Pair)     |
| 2       | RS-485 B (-) (Twisted Pair)     |
| 3       | Power Ground                    |
| 4       | Analog/Digital Input (0V to 5V) |
| 5       | +7V to +36V Input Power         |
| 6       | External Sync Input (5kHz)      |
| 7       | +5V Regulated Output            |
| 8       | Signal Ground                   |
| 9       | Self Test                       |
| 10      | CAN High                        |
| 11      | CAN Low                         |
| 12      | CAN Gnd                         |
| 13      | NC                              |
| 14      | NC                              |
| 15      | Case                            |

Note: Any unused inputs (Pins 4, 6, 9) must be connected to signal ground (Pin 8).

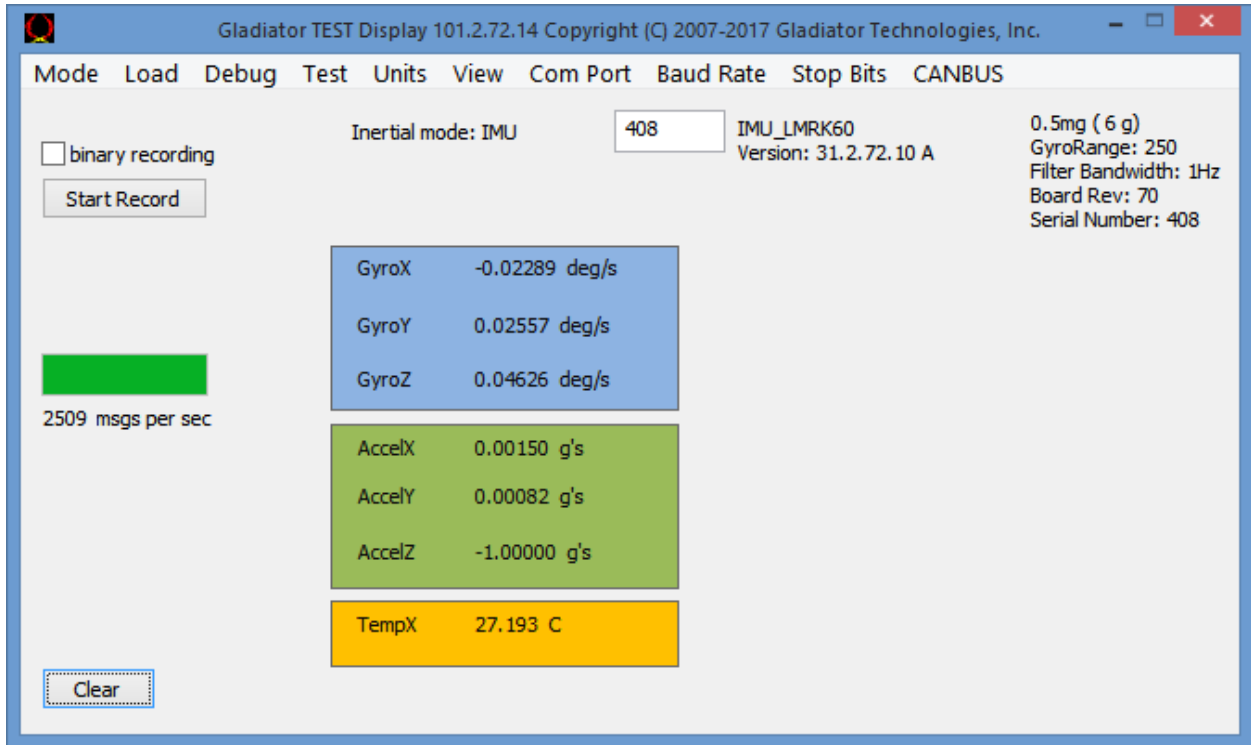
| Outputs | Serial Sequence                             |
|---------|---|
| 1       | Roll Gyro (X)                               |
| 2       | Pitch Gyro (Y)                              |
| 3       | Yaw Gyro (Z)                                |
| 4       | X Accelerometer                             |
| 5       | Y Accelerometer                             |
| 6       | Z Accelerometer                             |
| 7       | Temperature $\pm 0.5^\circ\text{C}$ typical |

| PARAMETER                        | RATE AXES   |  | ACCEL AXES                                 |   |
|----------------------------------|---|--|--|---|
| Range                            | $\pm 250^\circ/\text{sec}$  | $\pm 490^\circ/\text{sec}$               | $\pm 6\text{ g/s}$                         | $\pm 15\text{ g/s}$                       |
| ARW / VRW                        | 0.0016°<br>/sec/ $\sqrt{\text{Hz}}$ $1\sigma$   |  | 0.04mg/<br>/ $\sqrt{\text{Hz}}$ $1\sigma$  | 0.05mg/<br>/ $\sqrt{\text{Hz}}$ $1\sigma$ |
|                                  | 0.17°<br>/ $\sqrt{\text{hour}}$ $1\sigma$   | 0.2°<br>/ $\sqrt{\text{hour}}$ $1\sigma$ | 2.7m/s<br>/ $\sqrt{\text{hour}}$ $1\sigma$ | 4m/s<br>/ $\sqrt{\text{hour}}$ $1\sigma$  |
| Bias In-Run Stability            | 3°/hour<br>$1\sigma$  | 5°/hour<br>$1\sigma$                     | 0.025mg<br>$1\sigma$                       | 0.03 mg<br>$1\sigma$                      |
|                                  | 35°/hr<br>$1\sigma$   | 45°/hr<br>$1\sigma$                      | <0.10 mg<br>$1\sigma$                      | <0.15 mg<br>$1\sigma$                     |
| Scale Factor Error %             | $\leq 500\text{ ppm}$ (over temperature) $1\sigma$  |  |  |   |
| Non-Linearity<br>% of Full Scale | 0.05%   | 0.1%                                     | 0.05%                                      | 0.1%                                      |
|                                  | Sensor Resolution   |  | 0.03 mg                                    |   |
| Alignment                        | <0.5 mrad $1\sigma$   |  |  |   |
| G-Sensitivity                    | <0.001°/s/g $1\sigma$   |  | 0.25 mg/g <sup>2</sup> $1\sigma$           |   |
| Shock                            | 600g's 1/2 sine 1 msec powered  |  |  |   |
| Vibration                        | 8gRMS (20Hz to 3KHz 15g accelerometers)   |  |  |   |
| Update Rate                      | 2.5kHz (user selectable)  |  |  |   |
| Bandwidth                        | 250 Hz  |  |  |   |
| Temp Range                       | Operating: -40 °C to +85 °C   |  |  |   |
|                                  | Non-Operating: -55 °C to +85 °C   |  |  |   |
| Start-up Time                    | < 0.3 sec   |  |  |   |
| Input Power                      | <b>+7V to +36V Max. Input (single sided)</b>  |  |  |   |
| Power Consumption                | 500 mW Typical<br>550 mW Maximum  |  |  |   |
| Weight                           | $\leq 115\text{ grams}$   |  |  |   |
| Size                             | U.S.: 1.975 x 1.77 x 1.325 = 4.6 in <sup>3</sup>  |  |  |   |
|                                  | Metric: 5 x 4.5 x 3.4 = 76 cm <sup>3</sup>  |  |  |   |
| Mounting                         | 4ea No.8 or M4 Screws   |  |  |   |
| Self Test On                     | $\Delta 50^\circ/\text{s}$  |  | $\Delta 0.150$                             |   |
|                                  | $\pm 25^\circ/\text{s}$   |  | $\pm 0.075\text{ g}$                       |   |
| MTBF                             | Logic 1 = 3V to 5V at Pin 9   |  |  |   |
|                                  | 53,869 hrs (per MIL-STD-217F, Notice 2 based on AIC environment with ambient temperature at 40°C) |  |  |   |

Specification subject to change without notice

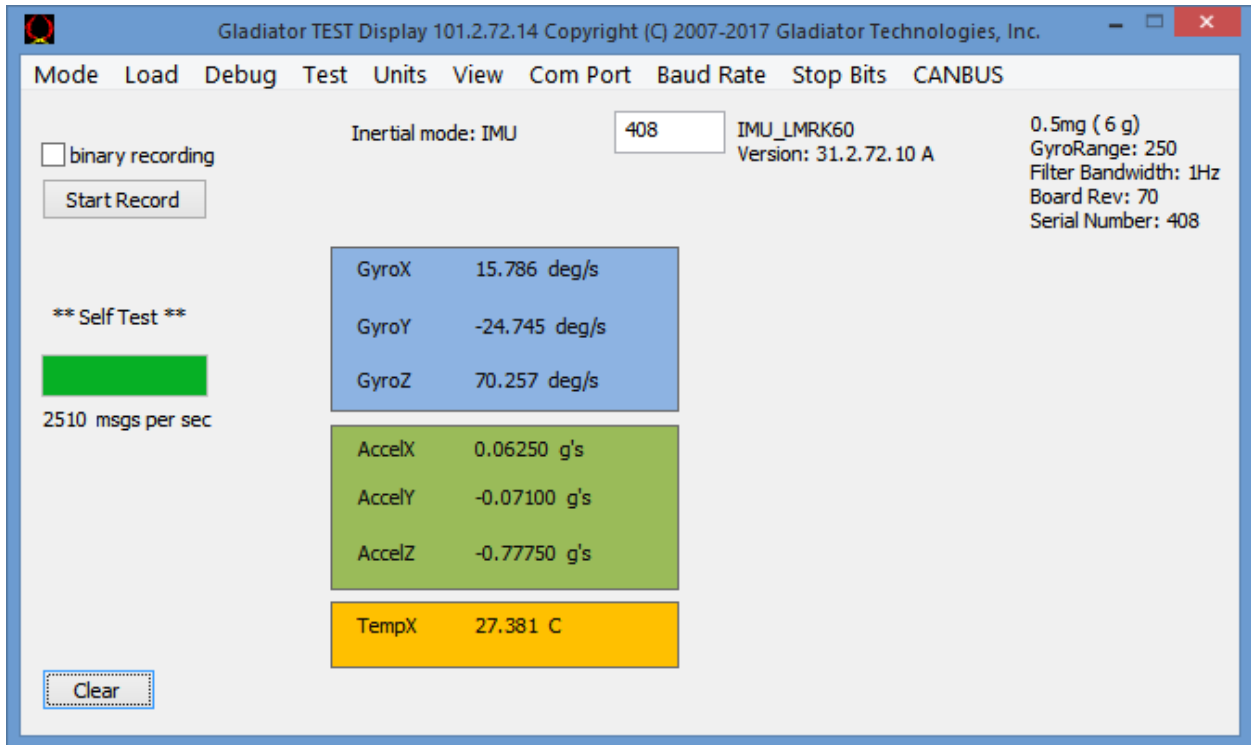


Rev. 17Sep07  
SN: 300



Initial Bench Readout (above)

Self Test (below)





LMRK60IMU-250-06-100  
Accelerometer Tumble Test

SN408 ATP

9/12/2017

| Test       | gyroX    | gyroY    | gyroZ    | accelX   | accelY   | accelZ   | temp X   |
|------------|----------|----------|----------|----------|----------|----------|----------|
| PX         | 0.002907 | 0.002813 | 0.001103 | 1001.562 | -0.6395  | 0.308    | 2612.598 |
| NX         | 0.002592 | 0.002012 | 0.002359 | -998.454 | -0.5735  | -0.3145  | 2613.48  |
| Diff/2     | 0.000158 | 0.000401 | -0.00063 | 1000.008 | -0.033   | 0.31125  | -0.441   |
| Ave        | 0.00275  | 0.002413 | 0.001731 | 1.55425  | -0.6065  | -0.00325 | 2613.039 |
| PY         | 0.003255 | -0.0068  | 0.003012 | -0.08    | 1000.857 | 0.0645   | 2610.991 |
| NY         | -0.00069 | -0.00292 | 0.00285  | -0.0915  | -999.1   | -0.1355  | 2609.738 |
| Diff/2     | 0.001974 | -0.00194 | 8.1E-05  | 0.00575  | 999.9785 | 0.1      | 0.6265   |
| Ave        | 0.001281 | -0.00486 | 0.002931 | -0.08575 | 0.8785   | -0.0355  | 2610.365 |
| PZ         | 0.0006   | -0.00365 | 0.00386  | 0.003    | 0.8855   | 1000.001 | 2610.516 |
| NZ         | 0.001454 | -0.00482 | 0.004149 | -0.1555  | 0.8675   | -1000.01 | 2610.571 |
| Diff/2     | -0.00043 | 0.000585 | -0.00014 | 0.07925  | 0.009    | 1000.003 | -0.0275  |
| Ave        | 0.001027 | -0.00424 | 0.004005 | -0.07625 | 0.8765   | -0.00225 | 2610.544 |
| Bias %s,mg | 0.0017   | -0.0022  | 0.0029   | -0.08    | 0.14     | -0.02    | 26.11    |
| ASF Norm   |          |          |          | 1.0000   | 1.0000   | 1.0000   | Temp °C  |

| Gyro °s /g | Input g = |         |         | Accel In g's |
|------------|-----------|---------|---------|--------------|
| x          | 0.0002    | 0.0020  | -0.0004 | x            |
| y          | 0.0004    | -0.0019 | 0.0006  | y            |
| z          | -0.0006   | 0.0001  | -0.0001 | z            |

| Accel Mis-Align | mrads | Accel In |
|-----------------|-------|----------|
| 0.01            | 0.08  | x        |
| -0.03           | 0.01  | y        |
| 0.31            | 0.10  | z        |



Accepted by:

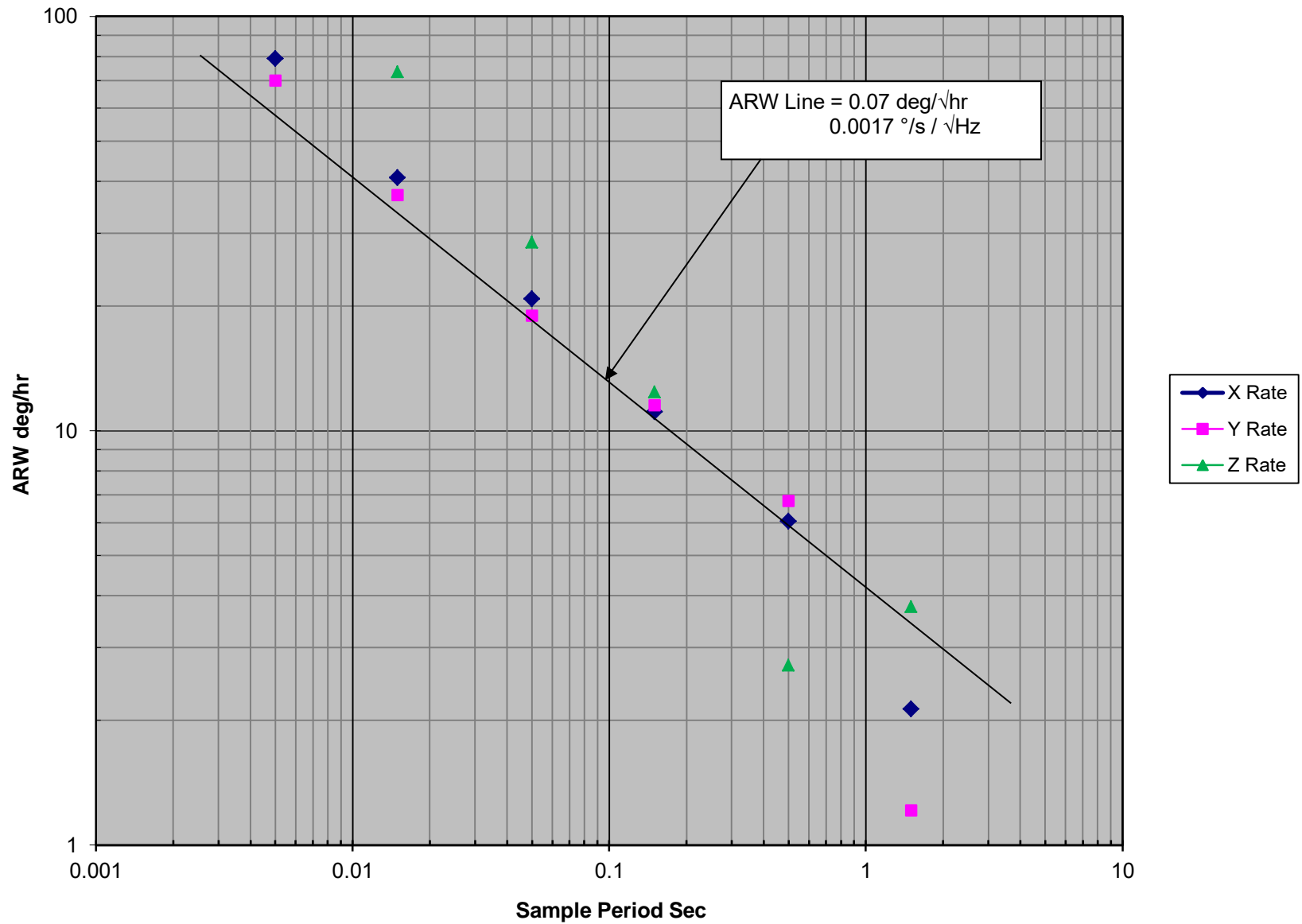
| Test     | gyroX    | gyroY    | gyroZ    | accelX   | accelY   | accelZ   | temp X           |
|----------|----------|----------|----------|----------|----------|----------|------------------|
| PX       | 143.985  | -0.00036 | 0.002817 | -0.098   | 4.877    | -16.368  | 2608.616         |
| NX       | -143.981 | -0.00765 | 0.006372 | -0.1105  | -10.2285 | -17.36   | 2607.648         |
| Diff/2   | 143.9828 | 0.003646 | -0.00178 | 0.00625  | 7.55275  | 0.496    | 0.484            |
| Ave      | 0.002245 | -0.00401 | 0.004595 | -0.10425 | -2.67575 | -16.864  | 2608.132         |
| PY       | 0.003828 | 143.994  | 0.001696 | -8.749   | -0.7515  | -16.3595 | 2610.384         |
| NY       | 0.002244 | -143.989 | 0.001622 | 6.2955   | -0.755   | -17.405  | 2608.747         |
| Diff/2   | 0.000792 | 143.9915 | 3.7E-05  | -7.52225 | 0.00175  | 0.52275  | 0.8185           |
| Ave      | 0.003036 | 0.002535 | 0.001659 | -1.22675 | -0.75325 | -16.8823 | 2609.566         |
| PZ       | -0.00086 | -0.00137 | 144.0036 | 6.7805   | -1.9035  | -1.4685  | 2609.982         |
| NZ       | 0.008341 | -0.00177 | -143.995 | -8.339   | -3.2815  | -1.4835  | 2608.92          |
| Diff/2   | -0.0046  | 0.000199 | 143.9993 | 7.55975  | 0.689    | 0.0075   | 0.531            |
| Ave      | 0.003738 | -0.00157 | 0.004295 | -0.77925 | -2.5925  | -1.476   | 2609.451         |
| RSF Norm | 0.99988  | 0.999941 | 0.999995 |          |          |          | Temp °C<br>26.09 |

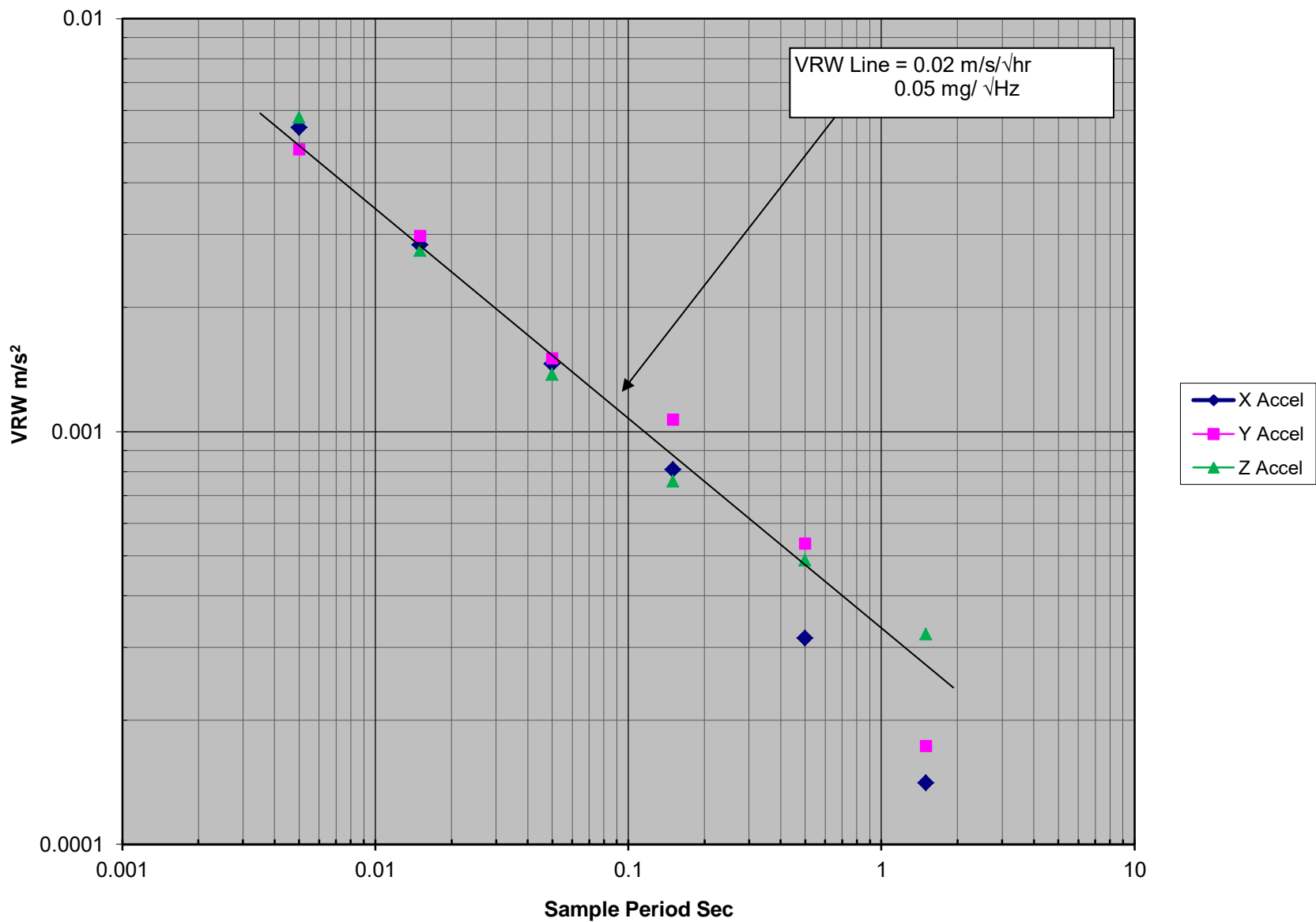
| Gyro Mis-Align deg/sec |         |        | Input Rate |   |
|------------------------|---------|--------|------------|---|
| x                      |         | 0.0008 | -0.0046    | x |
| y                      | 0.0036  |        | 0.0002     | y |
| z                      | -0.0018 | 0.0000 |            | z |

| Gyro Mis-align mrad |        |       | Input Rate |   |
|---------------------|--------|-------|------------|---|
| x                   |        | 0.006 | -0.032     | x |
| y                   | 0.025  |       | 0.001      | y |
| z                   | -0.012 | 0.000 |            | z |

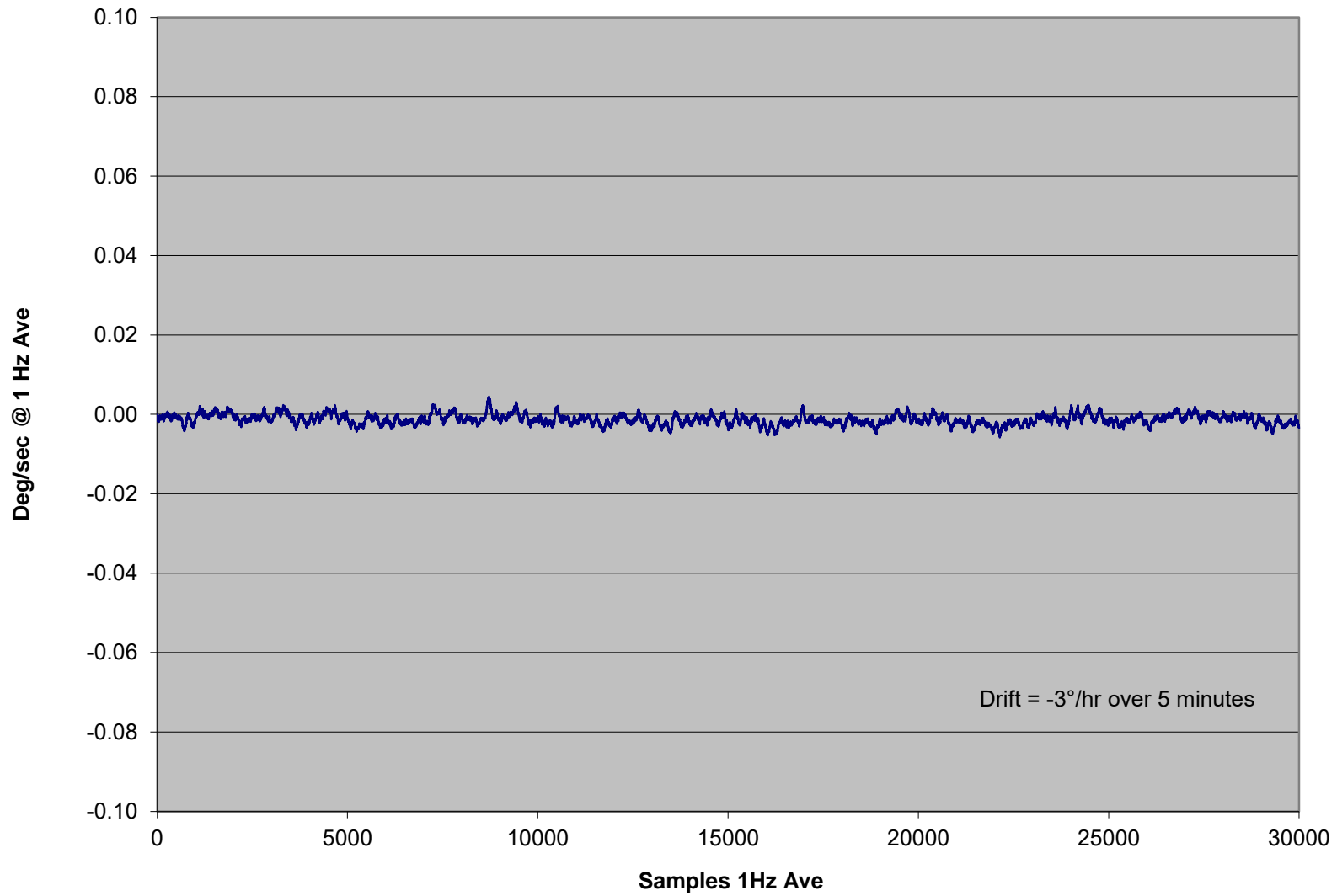


Accepted by:

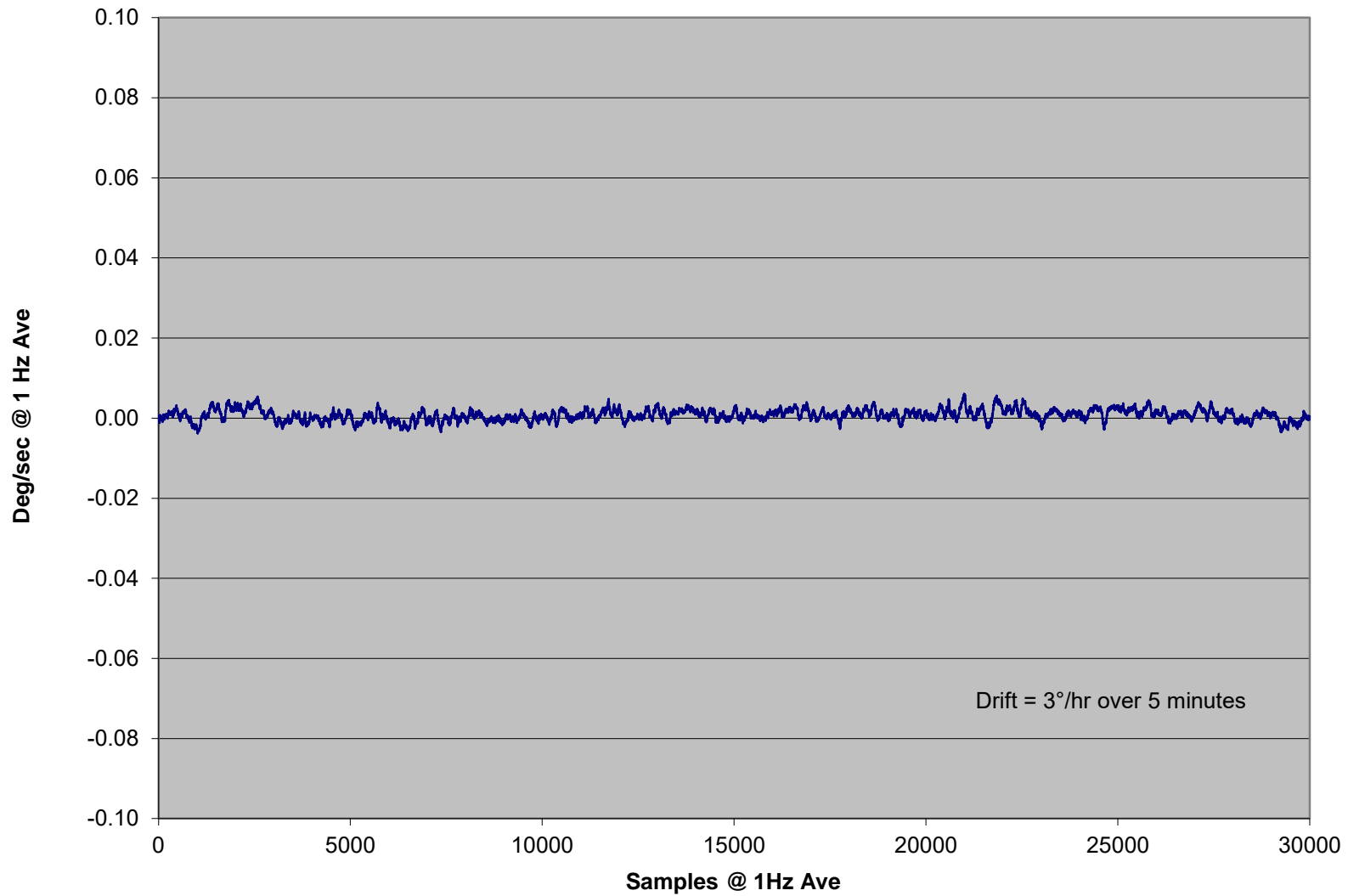




### X Gyro In-Run Bias

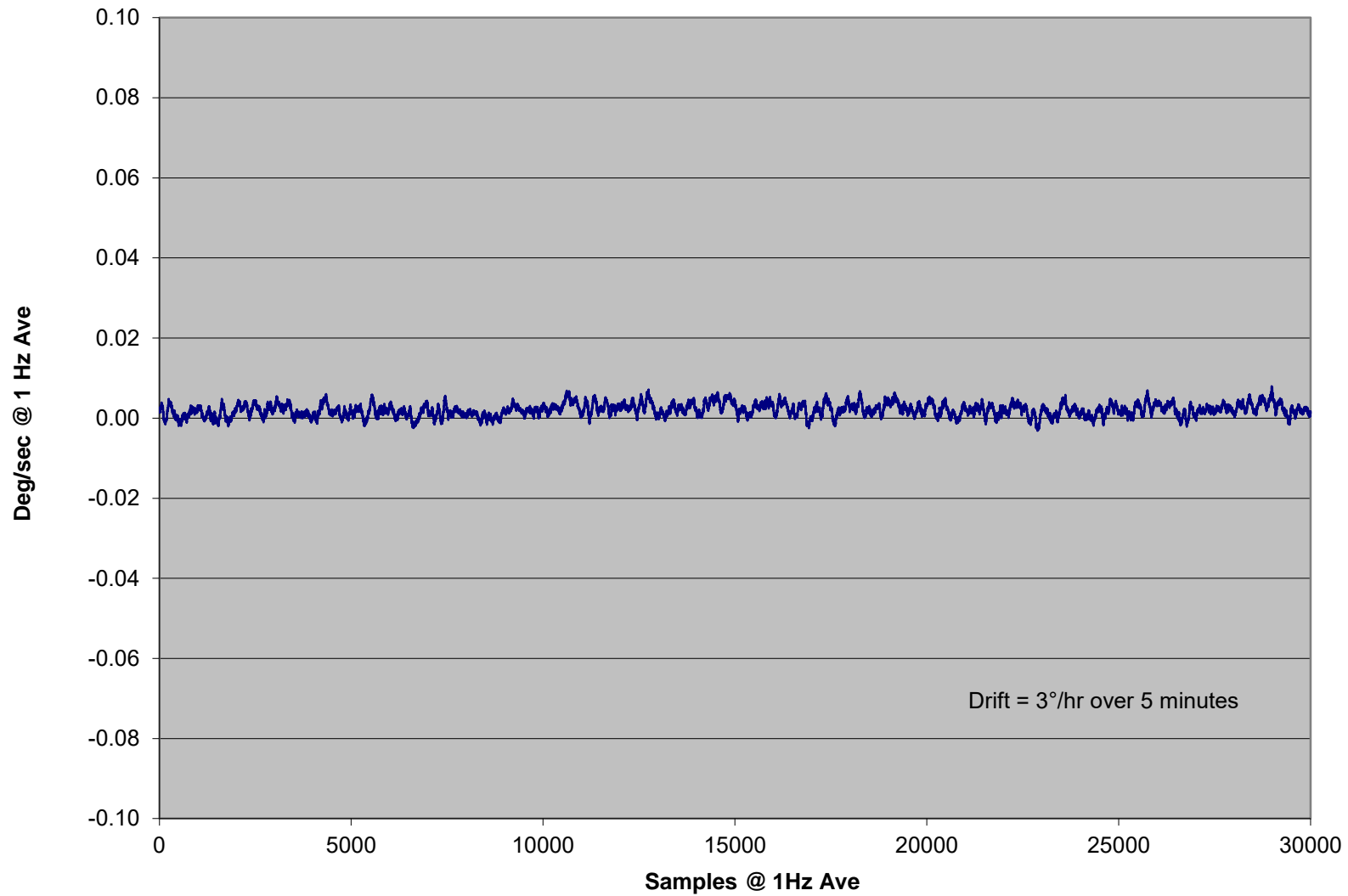


### Y Gyro In-Run Bias

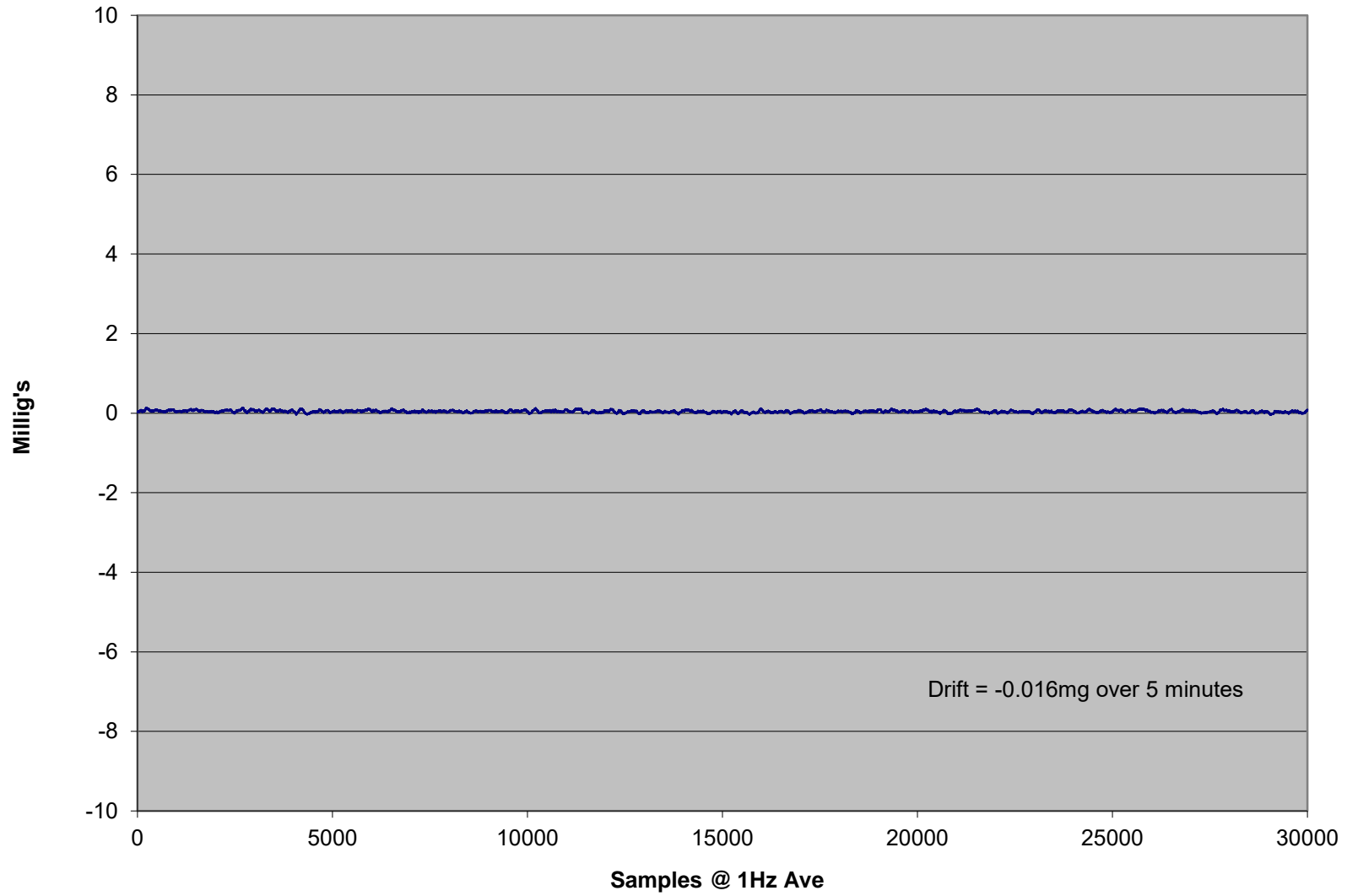




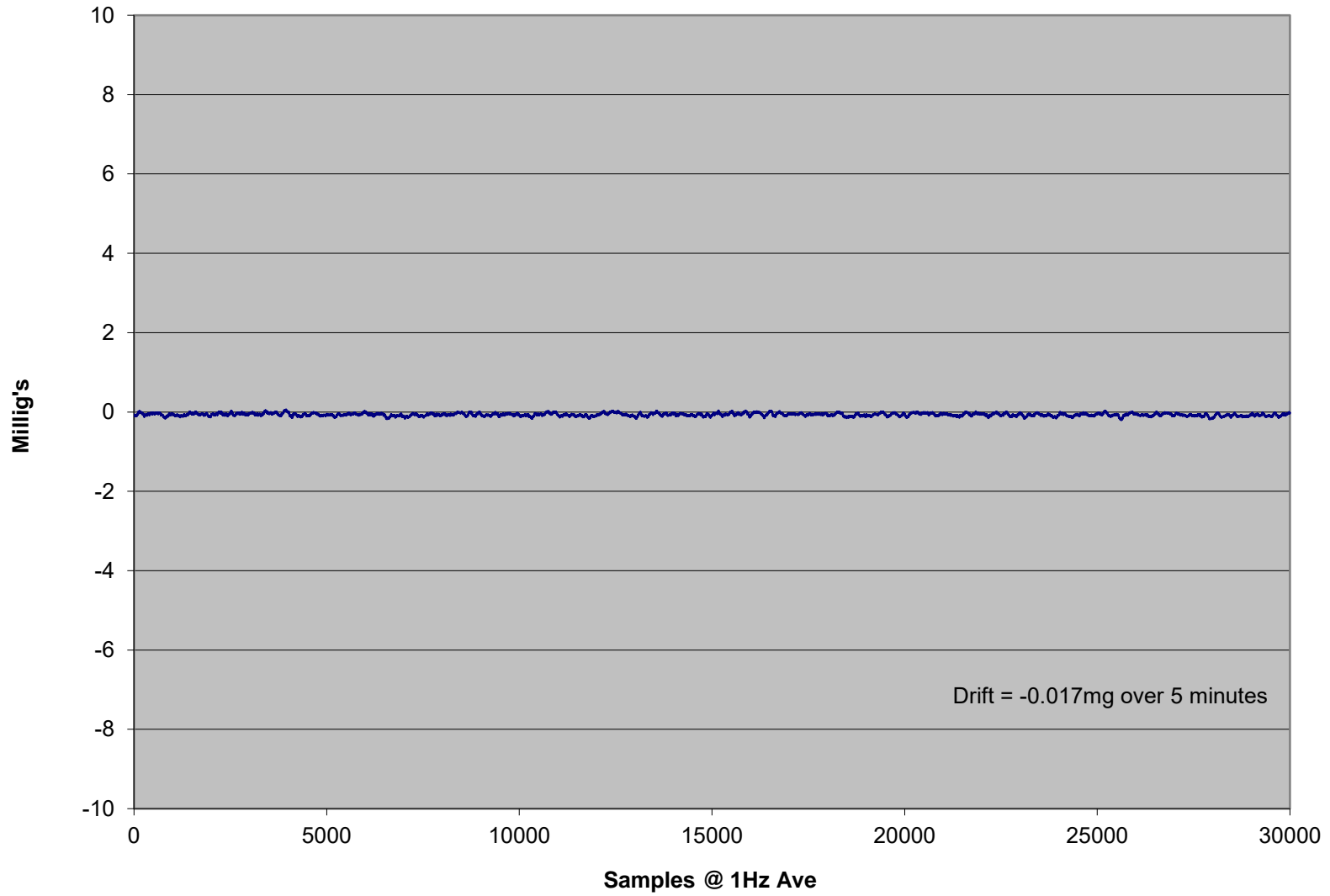
### Z Gyro In-Run Bias



### X Accel In-Run



### Y Accel In-Run



### Z Accel In-Run

