

## **Setting Accelerometer Biases**

NOTE: This instruction assumes that the MIDG Series INS/GPS Software and Utilities has previously been installed on the computer. This software needs to be installed prior to performing this operation.

**1 Introduction.** The MIDG Series INS/GPS has the capability to compensate for the accelerometer biases. this functionality is provided to compensate for the inherent biases in the accelerometers.

**2 Prerequisites.** The following prerequisites will be needed to perform this operation: MIDG Series INS/GPS, MIDG Display Utility installed; MIDG Series INS/GPS Interface cable (MBI#SLC2JUSB, SLC2J09SF, or user supplied), a known flat surface and this instruction.

WARNING: DO NOT apply power to unit prior to connecting the interface cable. DO NOT use voltages higher than stated in the MIDG Series INS/GPS specifications sheet. DO NOT connect the GPS antenna to the unit while powered. Doing any of these actions may damage the unit. <u>THESE DAMAGES ARE NOT COVERED BY WARRANTY.</u>

**3** Set Up. Performing the accelerometer bias compensation must be done prior to mounting the unit into the application. Refer to the MIDG Series INS/GPS for information on how to properly interface the unit with a PC or laptop.

- 1. <u>Open an instance of the MIDG Display Utility and select the</u> <u>communications port (Port) which will be used</u> (Figure 1).
- 2. <u>Select "Options" drop -down menu, then select "MIDG</u> <u>Config." to open the MIDG Config dialog box</u> (Figure 1).
- 3. <u>Select the "Accel" tab of the MIDG Config dialog box</u> (Figure2)
- 4. <u>Enter a zero (0) for the "x," "y," and "z" biases. Press the</u> <u>"Set" button to send these to the unit.</u>

The MIDG Series INS/GPS is now ready for the accelerometer bias procedure.

**4** Compensating for Accelerometer Biases. The following steps will instruct the user on how to perform the measurements to calculate for the accelerometer biases.

1. <u>Locate the "Nav Sensor" section on the</u> <u>"NAV/GPS" tab of the MIDG II Display utility</u> (Figure 3). The column of data which will be used is "ax, ay, az."



- 2. <u>Using the flat surface, place the unit on the "-z"</u> <u>axis (product label facing up) and record the "-az"</u> <u>value. Flip the unit over to the "+z" axis (product label facing down) and record the "+az"</u> <u>value (Figure 3).</u>
- 3. Using the formula shown below, calculate the "z" axis bias.

Accel Bias(z) = 
$$\frac{-az + az}{2}$$

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Figure 1. MIDG Display



Figure 2. Accel tab.



- 4. <u>Using the flat surface, place the unit on the "-y" axis (calibration label facing down) and</u> record the "-ay" value. Flip the unit over to the "+y" axis (calibration label facing up) and record the "+ay" value (Figure 4).
- 5. <u>Using the formula shown below, calculate the "y" axis</u> bias.

Accel Bias(y) = 
$$\frac{-ay + ay}{2}$$

Time stamp (ins) 2233000 Tot	Time Stamp (ins) 2201000 1 07
Nav Sensor	Nav Sensor
p -0.49 ax -7 yaw -100.66	p 0.00 ax -8 yaw -105.51
q -0.02 ay -1000 pitch 0.93	g -0.33 ay 992 pitch -0.98
r -0.17 az -16 roll 78.28	r -0.03 az 13 roll -90.12
Time Stamp (ms) 2293360 F 80	Time Stamp (ms) 2201700 F 80
Nav PV	Nav PV

Figure 4. Nav Sensor section of the NAV/GPS tab ("ay" bias shown).

- 4. Using the flat surface, place the unit on the "-x" axis (connectors facing up) and record the "-ax" value. Flip the unit over to the "+x" axis (connectors facing down) and record the "+ax" value (Figure 5).
- 5. <u>Using the formula shown below, calculate the "x" axis bias.</u>

Accel Bias(x) = 
$$\frac{-ax + ax}{2}$$

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Nav Sensor			Nav Sensor
р - <mark>0.16</mark> ах	-999 yaw	156.94	p 0.02 ax 999 yaw 92.55
q -0.23 ay	0 pitch	-88.31	q 0.19 ay -7 pitch 87.79
r -0.01 az	-26 roll	86.06	r -0.26 az -19 roll -19.38
Time Stamp (ms)	2463100	F 80	Time Stamp (ms) 2619080 F 90
Nav PV			Nav PV

Figure 5. Nav Sensor section of the NAV/GPS tab ("ax" bias shown).

These three (3) calculated values are the biases and will be entered into the MIDG Config dialog box under the "Accel" tab.

Note: Bias values should range from -30 to +30. If calculated bias values are beyond this range, the unit is out of calibration and will need to be returned for a full recalibration.

## 6. Enter the calculated biases into the "Config" dialog box under the "Accel" tab (Figure 6).

Note: Only whole number values may be entered into the "Accel" tab. Bias values which result in decimals will need to be rounded.

## 7. <u>After the bias values are entered, press the "Set" button at the bottom of the "Config" dialog box.</u>

8. <u>Select the "General" tab and press the "Save Configuration" button</u> <u>to store the values as part of the configuration profile.</u> These values will be saved even during a loss of power to the unit (Figure 7).

Figure 8 shows the accelerometer values before and after bias corrections. As can be noted, even though these bias values are in milli-g's (mg), they do produce a profound effect on unit's performance.



Figure 8. Accelerometer readings before and after bias corrections.

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0	Query Set Ack received				
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Figure 7. General tab.

**5** Help and Support. Microbotics, Inc. is dedicated to supporting the missions of our clients and offers free thirty (30) days of support for all of our products.

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