ACOUSONDE™ ATTITUDE/HEADING AXIS CONVENTION UPDATE

Model B003A and B003B

Firmware version 2.0.14, PalmOS client software version 2.0.3
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ACOUSONDE™ ATTITUDE/HEADING AXIS CONVENTION UPDATE

Model B003A and B003B

William C. Burgess

Acoustimetrics
Felton, California
E-mail: tech at acousonde dot com

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1 INTRODUCTION

Marine navigation systems typically adopt the "north, east, down" reference-frame convention to represent attitude and compass heading. Acousonde units released in 2011 and after use axis conventions optimally compatible with this standard (Figure 1).

Alignment of the compass X, Y, or Z axes towards north yields positive samples in the corresponding channel. Samples from the X channel will be near maximum when the Acousonde points north; from the Y channel when the Acousonde points west; and from the Z channel when the Acousonde's bottom points north.

Accelerometer X, Y, and Z* channels yield positive samples when the device is accelerated in the corresponding direction. Since gravity is equivalent to acceleration away from the Earth, it will induce positive samples on X when the Acousonde is pointed up; on Y when the Acousonde is positioned horizontally on its left side (i.e. 90° left roll); and on Z when the Acousonde is upside down.

## 1.1 WHO SHOULD UPDATE THEIR AXIS CONFIGURATIONS

Acousonde units released in 2010 and before use alternate axis definitions (Figure 2). Acoustimetrics recommends that all pre-2011 units be updated for maximum compatibility. Updating may be less important for users who foresee no kinematic applications.

This document describes how to apply this update using a PalmOS-compatible handheld computer (henceforth "Palm").
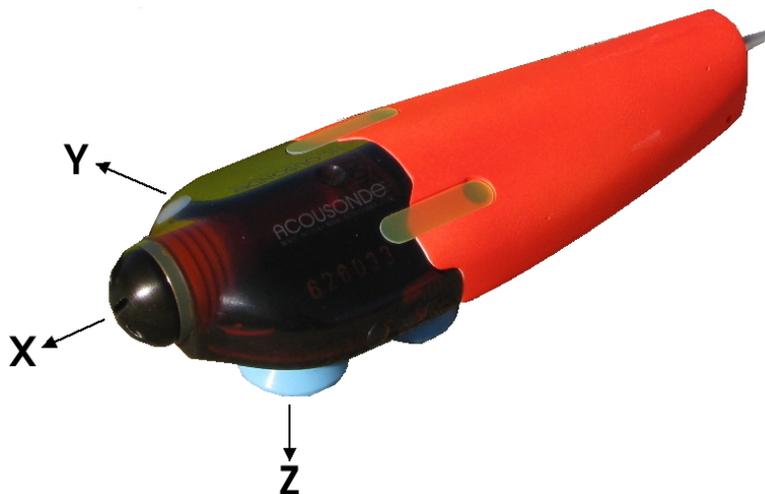
Figure 1.   Acousonde accelerometer and compass axes as configured in 2011.

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* To distinguish files containing accelerometer data from those containing compass data, the third character of accelerometer filenames is I, J, or K while the third character of compass filenames is X, Y, or Z.
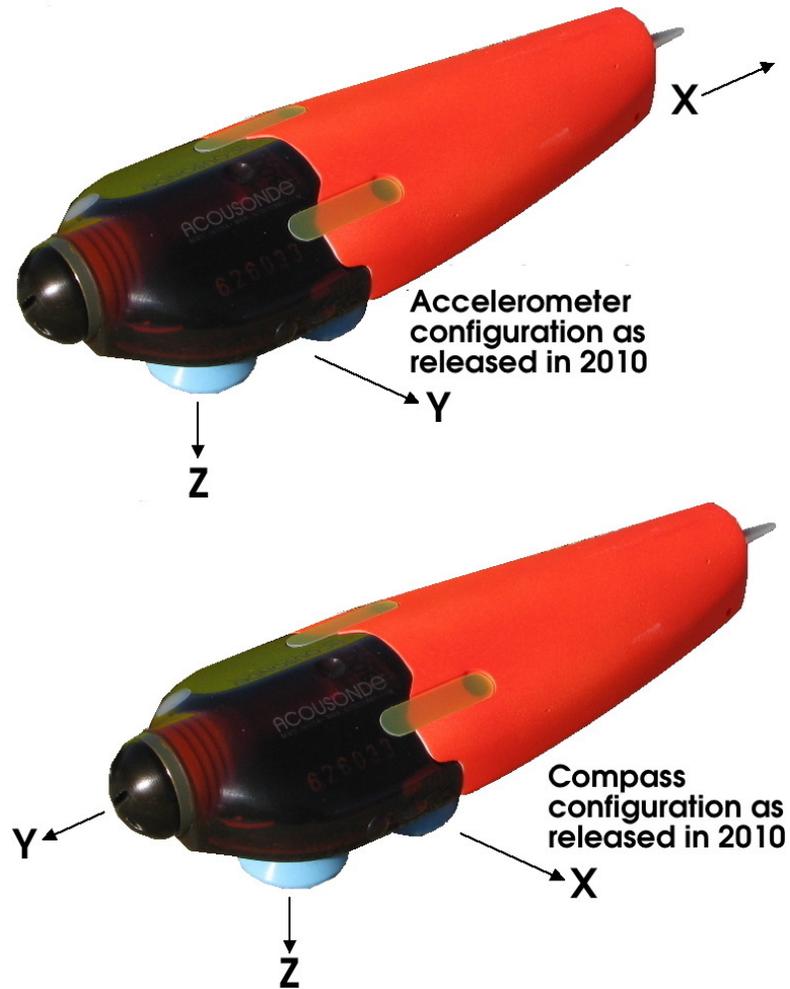
Figure 2. **Acousonde accelerometer and compass axes as configured prior to 2011.** Units released in 2010 or before that have not been updated use this axis configuration, now deprecated in favor of that shown in Figure 1.

1.2 HOW TO TELL IF YOUR UNIT USES THE OLDER AXIS CONVENTIONS

First, if your serial number is B003A023 or above, or B003B005 or above, your unit already uses the 2011 conventions and this update does not apply.

Many of the units released in 2010 and before have been updated already. As of January 2011, the following units remain that use the older axis conventions (the leading "B003" on all serial numbers is omitted):

```
A001 (Acousonde 3A cylindrical units)
A002
A011
A012
A013
A014
A019
A022
B001 (Acousonde 3B flat units)
B002
B003
B004
```

If your serial number is among those listed above, a check of the accelerometer readings will reveal if your unit has been updated to the newer conventions. Ensure your Acousonde is powered up and in the standby mode. Orient it so its leading edge is pointed down (for the Acousonde 3A cylindrical recorder, this means the battery cap will be the highest point of the unit, while for the Acousonde 3B, the battery cap will be the lowest point of the unit).

Run the **Acousonde** PalmOS application on your Palm, and select the CHECK SENSORS page from the master drop-down menu. Use the **Read** button to send a read-sensors request to the Acousonde. Once the read request has been transferred to the Acousonde, make sure the Acousonde remains pointed down and relatively still, and keep the Palm's infrared port pointed at the Acousonde. After 1–2 seconds, the Acousonde will transmit a list of sensor readings back to the Palm.

Check the sensor reading for the "Acceleration X" channel; it should be negative and between -800 and -1100 mg. If not, your unit is likely to have the older axis configuration.

1.3 POTENTIAL ISSUES WITH UPDATING

Once updated, units running Firmware 2.0.13 or earlier will respond to a Palm sensor check by sending compass X on the Y channel and compass Y on the X channel; that is, the CHECK SENSORS page of the PalmOS **Acousonde** application will show swapped X and Y compass data. Data files written during sampling, however, will have correct X and Y characters in their filenames and correct Mag/X and Mag/Y channel abbreviations in their metadata. Firmware versions 2.0.14 and later correct this issue, and are compatible with both updated and non-updated axis configurations.

2 UPDATING TO THE 2011 AXIS CONFIGURATION

The Acousonde's axis configurations are kept in the *Configuration File*. This file is transferred via infrared between the Acousonde and a Palm. To obtain it, run the **Acousonde** application on the Palm and select the **DOWNLOAD** page from the master drop-down menu. Select the **Configuration** download type as shown in Figure 3, and use the **Download** button to send the infrared download request. The Acousonde will respond by transmitting its calibration file.

Upon receiving the calibration file, most Palms will offer to load it into the built-in **Memo Pad** application. Some, such as the Palm TX, may load it into more elaborate editing software called **Documents**. The following assumes you have a Palm that loads the file into **Memo Pad** (the **Documents** software is equally capable of editing and beaming files, but instructions on its use are beyond the scope of this guide).

After receiving the file, the Palm will run **Memo Pad** and show the file. The beginning of the file will look similar to the following example. Several fields will differ depending on the unit.

```
AConf_B003A013.txt
HW B003A013
RV 4
AS B
NN
OP
DC
MD Sat Feb 27 2010
X0 8826
0T 22.26
BL 3300
BD 3000
BW 2000
!
```
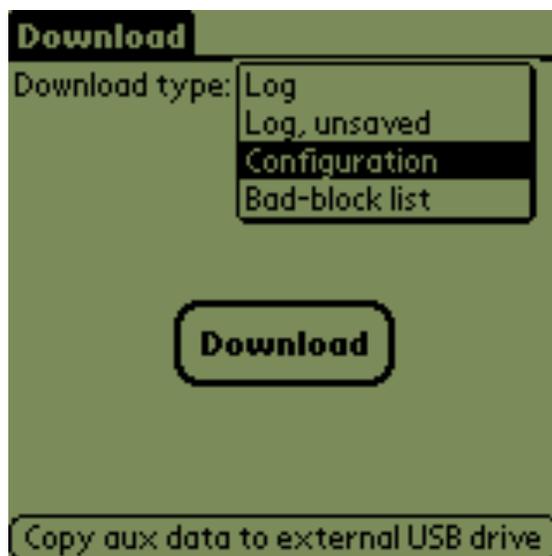

Figure 3. The Acousonde Download page.

2.1 ADDING THE USER PASSWORD TO THE CONFIGURATION FILE

Use the **Memo Pad** application to insert a new line of text – "PW Fin" – after the `BW` field. The capitalization of PW is not important, but the word **Fin** must be capitalized as shown. **Fin** is the *User Password*, meaning that when you send this file back to the Acousonde it will overwrite the user configuration, not the factory configuration. If anything goes wrong, the user calibration can always be replaced with the original factory calibration.

After adding the PW field, the beginning of the file will look like this. The only change is in **boldface**; even if the fields in this example differ from yours, ***do NOT modify any of the existing fields in this part of your file!*** You need only add the PW field to this section.

```
AConf_B003A013.txt
HW B003A013
RV 4
AS B
NN
OP
DC
MD Sat Feb 27 2010
X0 8826
0T 22.26
BL 3300
BD 3000
BW 2000
PW Fin
!
```

With the user password added, you will need to scroll down so you can edit the axis configurations located further into the file.

2.2 EDITING THE COMPASS CONFIGURATION

The compass channel descriptions for a unit with the earlier axis configuration will look like this. Your file may show additional fields, such as HT and HC. Comments (for example, `<--This is a comment`) have been added to indicate the five fields for the X and Y axes that need to change (no changes to the Z axis are necessary).

```
!
! Subsystem 1 channel 0
! Updated Fri Jul 30 2010 1117:07
!
XC 010
AB Mag/X          <-- Channel abbreviation will be Mag/Y, not Mag/X
AL X              <-- Channel filename letter code will be Y, not X
SN HMC1043
RB 24
CB 16
FT 0x70
FC 0
SF 0x1            <-- Sampling flags will be 0x11, not 0x1
PO 0
PS 7
SC 4768372e-7
UN mG
OF 0
GN 100
!
! Subsystem 1 channel 1
! Updated Fri Jul 30 2010 1117:07
!
XC 011
AB Mag/Y          <-- Channel abbreviation will be Mag/X, not Mag/Y
AL Y              <-- Channel filename letter code will be X, not Y
SN HMC1043
RB 24
CB 16
FT 0x70
FC 0
SF 0x11
PO 0
PS 7
SC 4768372e-7
UN mG
OF 0
GN 100
```

After editing, the compass X/Y portion of the configuration file will look like this. The five changes are denoted in **boldface**. ***Do not modify any fields other than these five, even if some of them appear different from this example!***

```
!
! Subsystem 1 channel 0
! Updated Fri Jul 30 2010 1117:07
!
XC 010
AB Mag/Y
AL Y
SN HMC1043
RB 24
CB 16
FT 0x70
FC 0
SF 0x11
PO 0
PS 7
SC 4768372e-7
UN mG
OF 0
GN 100
!
! Subsystem 1 channel 1
! Updated Fri Jul 30 2010 1117:07
!
XC 011
AB Mag/X
AL X
SN HMC1043
RB 24
CB 16
FT 0x70
FC 0
SF 0x11
PO 0
PS 7
SC 4768372e-7
UN mG
OF 0
GN 100
```

2.3 EDITING THE ACCELEROMETER CONFIGURATION

The accelerometer channel descriptions for a unit with the earlier axis configuration will look like this. Your file may show additional fields, such as HT and HC. Comments (for example, `<-- This is a comment`) have been added to indicate the two fields for the X and Y axes that need to change (no changes to the Z axis are necessary).

```
!
! Subsystem 2 channel 0
! Updated Fri Jul 30 2010 1117:07
!
XC 020
AB Accel/X
AL I
SN LIS302DL
RB 8
CB 8
FT 0x0
FC 0
SF 0x11          <-- Sampling flags will be 0x1, not 0x11
PO 0
PS 0
SC 18e0
UN mg
OF 0
GN 100
!
! Subsystem 2 channel 1
! Updated Sun Nov 08 2009 0000:00
!
XC 021
AB Accel/Y
AL J
SN LIS302DL
RB 8
CB 8
FT 0x0
FC 0
SF 0x1           <-- Sampling flags will be 0x11, not 0x1
PO 0
PS 0
SC 18e0
UN mg
OF 0
GN 100
```

After editing, the accelerometer X/Y portion of the configuration file will look like this. The two changes are denoted in **boldface**. ***Do not modify any fields other than these two, even if some of them appear different from this example!***

```
!
! Subsystem 2 channel 0
! Updated Fri Jul 30 2010 1117:07
!
XC 020
AB Accel/X
AL I
SN LIS302DL
RB 8
CB 8
FT 0x0
FC 0
SF 0x1
PO 0
PS 0
SC 18e0
UN mg
OF 0
GN 100
!
! Subsystem 2 channel 1
! Updated Sun Nov 08 2009 0000:00
!
XC 021
AB Accel/Y
AL J
SN LIS302DL
RB 8
CB 8
FT 0x0
FC 0
SF 0x11
PO 0
PS 0
SC 18e0
UN mg
OF 0
GN 100
```

2.4 SENDING THE UPDATED CONFIGURATION FILE BACK TO THE ACOUSONDE

Once you have added the user password to the configuration file and made the seven necessary changes to the compass and accelerometer X/Y channel descriptions, you must send the updated file back to the Acousonde for the changes to take effect. To do this, use the **Memo Pad** application's **Beam Memo** menu item to send the file via infrared.

As the configuration file is being transferred, the Acousonde will flash its red Alert LED to indicate whether the changes have been accepted or not. If the Alert LED flashes anything other than a Note Alert (see Figure 4), the changes were not accepted.

If you see the expected Note Alert, use the **Acousonde** PalmOS application's CHECK SENSORS page as described earlier to verify expected behavior. Remember that, for firmware versions 2.0.13 or before, the Palm will show Compass X in the Compass Y field and vice versa once the convention update is applied (firmware versions 2.0.14 and later fix this behavior). Data files will have the correct filenames and metadata regardless.

If you see rapid flashing, or any behavior other than a Note Alert, the edited configuration file was rejected. Check the edits and retry. If you suspect an unintended edit, reload the configuration file to the Palm from the Acousonde and edit again from the beginning.
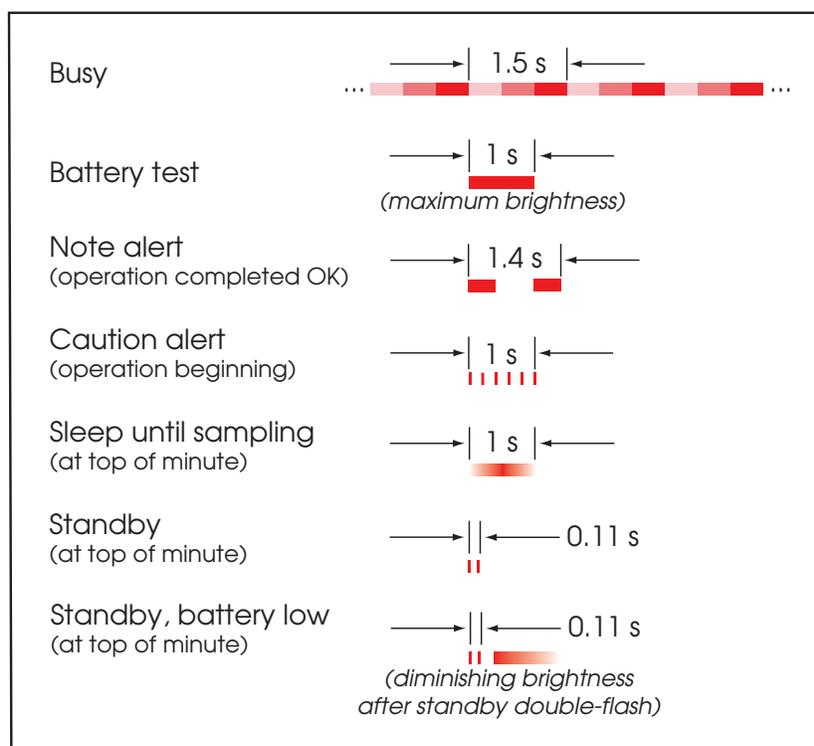

Figure 4. Normal Alert LED behavior.