Attitude and Heading Reference System

AHRS

DEMO PROGRAM “AHRS DEMO”

Quick Start Guide

Revision 2.1

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Revision history

Revision	Date	Author	Description
1.0	13-Aug-12	AK	Released version.
2.0	18-Mar-13	AK	For AHRS Demo Software ver.15.0 and higher. Changed interface of AHRS Demo.
2.1	05-Mar-14	ON	1. Marketing changes. 2. Updated screenshots.

Table of contents

General information

Operating system. This version of the program is fully compatible with the operating system MS Windows XP. It can be run also with MS Windows Vista and MS Windows Seven.

Working with the program. The "AHRS Demo" program is a windows-based Win32 application, and standard means used in the Windows (mouse and keyboard) are needed to use it. Directory structure necessary for data storage is created by user. All necessary configurations and calibration coefficients are stored in the AHRS nonvolatile memory, and they are automatically loaded into the AHRS microprocessor. Calibration coefficients are set by AHRS developers, and they can be changed, but only under guidance of the AHRS developer. Upon termination the "AHRS Demo" program creates an AHRS_Demo.ini file for its operation, in which the latest used parameters of the microprocessor and shell are stored. During work with the AHRS, the files with extensions .txt, .rtf, .prm, .dat and .bin can be created. Files with extensions .txt and .rtf can be created by operator, and files with extensions .prm, .dat and .bin are created automatically by the program when it is saving text or graphical data.

Requirements to the system resources. The program requires 6 Mbytes of RAM for proper operation. Hard disk capacity required for proper operation is determined by the size of the program files (approximately 12 MBytes) and by the files saved during operation, no more than 100 Mbytes. Recommended screen resolution is 1280x1024 pixels. The AHRS is connected to a computer through a standard COM port. The AHRS can also be connected to a PC through a USB port with a COM-to-USB converter. In this case, reliability of signal reception/transmission between a PC and the AHRS can greatly depend on the quality of the COM-to-USB converter and on correct configuration of its driver. AHRS manufacturer guarantees reliable operation of the AHRS if it is connected directly to the COM port. In the Appendix A, installation and configuration of drivers for one of the possible COM-to-USB converters is described.

Requirements to operators. The AHRS Demo software uses a standard Windows operating system. Therefore, operators should know the basic principles of PC operation to use the program, and they should be able to use the Windows operating system.

1. Demo software and drivers installation

The “Inertial Labs AHRS Demo” software doesn’t require any installation. Just copy the software folder AHRS_Demo_150 to the working directory.

When you connect the AHRS to a standard computer COM port, drivers are not needed. If the AHRS is connected to a USB port with a COM-to-USB converter see “Appendix A. Installation of the COM-to-USB converter drivers” for more details.

2. Checking COM-port number to which the AHRS is connected

To know the number of the COM port to which the AHRS is connected, click «**Device Manager**» in the «**Hardware**» tab of the «System Properties» window (Fig. 2.1). In the opened «Device Manager» window (Fig. 2.2) you will see the COM ports which will be marked as «**Communications Port (COMN)**» or «**USB Serial Port (COMN)**».

If the AHRS is connected to a standart computer port then look what number “N” is in the port name «**Communications Port (COMN)**».

If the AHRS is connected to a USB port with a COM-to-USB converter you will need to know the number of the additional COM-port set by OS. This number “N” appears in the port name «**USB Serial Port (COMN)**». Please check and configure parameters of this port for correct operation of the AHRS. For detail information see “Appendix B. Checking and configuration of COM-port to which the AHRS is connected”.

Fig. 2.1

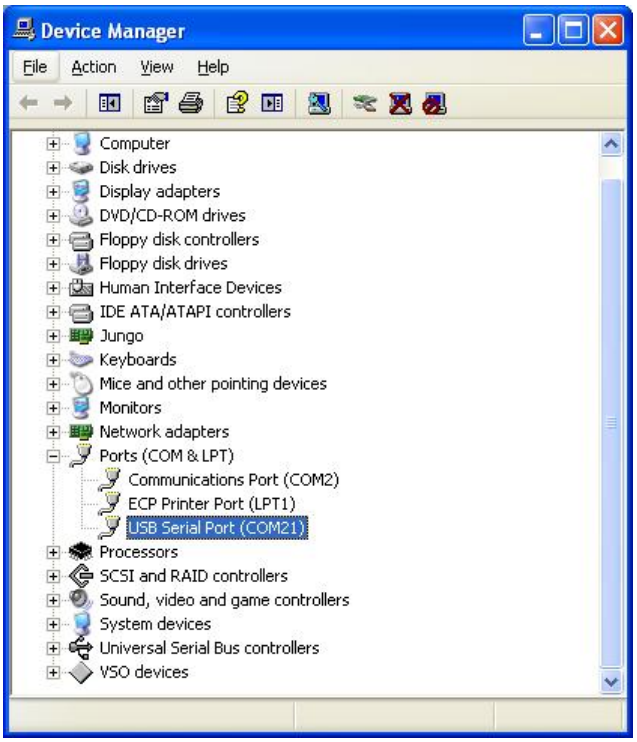

Fig. 2.2

3. Run the program

Step 1. Connect a power cable and data transfer cable to the AHRS. Connect the other end of the data transfer cable to either COM port or USB port of the host computer. If connection between the computer and the AHRS is done through a USB port, a driver for a COM-to-USB converter needs to be installed. See see section 1. “Installation of drivers and configuration of PC parameters” for details on the installation procedure.

After power connection of the AHRS check red light of the indicator lamp near the connector.

Step 2. Start AHRS_Demo.exe file to begin working with the Demo program. The main menu will appear (Fig. 3.1).

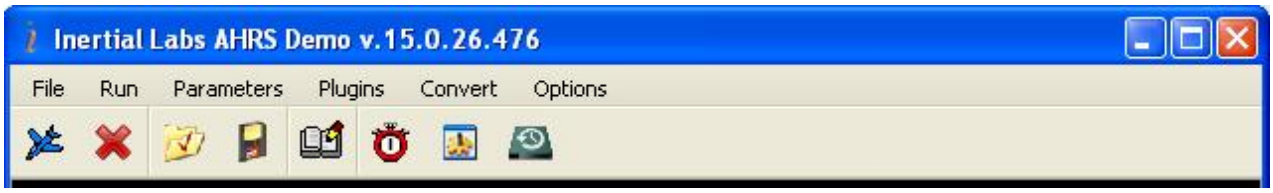

Fig. 3.1

Step 3. Select **«Test options…»** from the **«Options»** menu or click button. «Test option» window (Fig.3.2) will open.

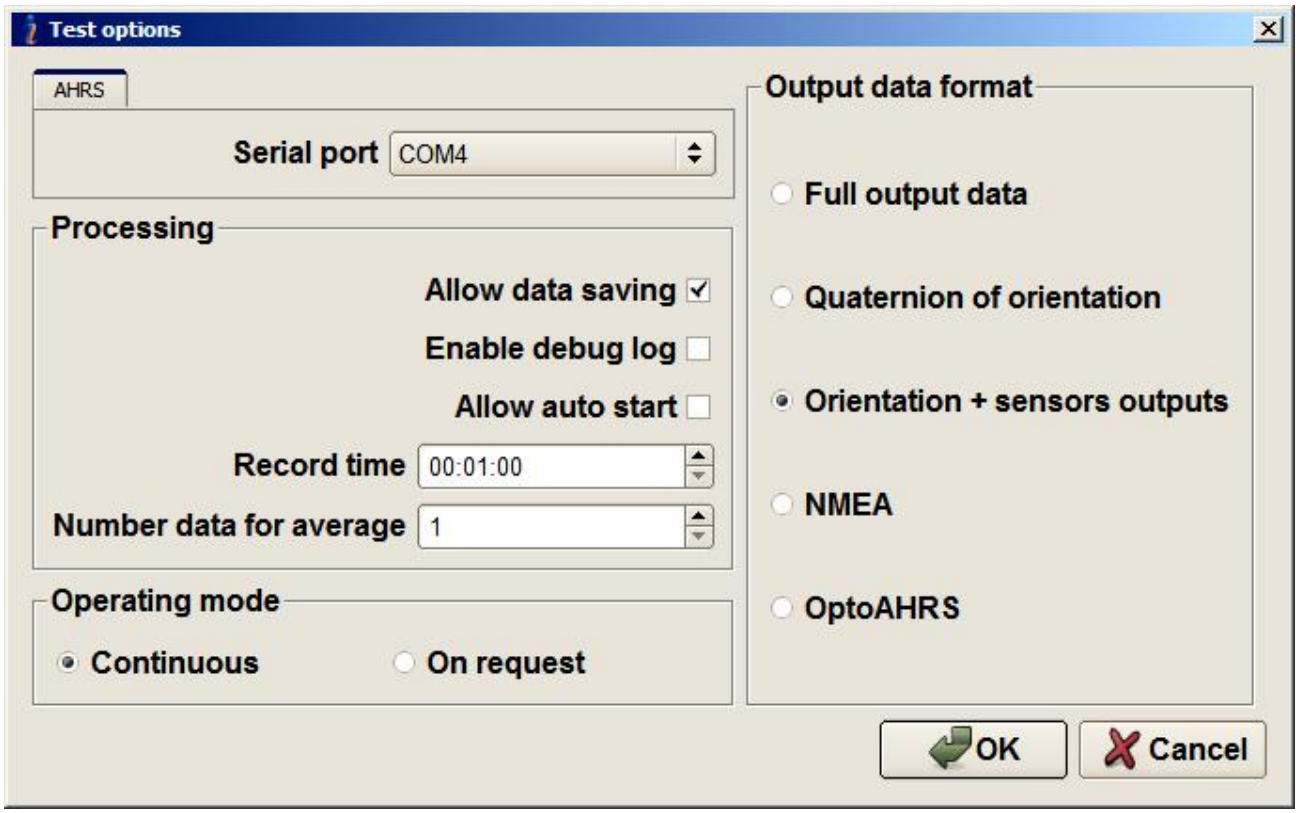

Fig. 3.2

Step 4. Set the correct COM port number **«Serial port»**.

Step 5. Select «**AHRS visualization**» from the «**Run**» menu or click button on the toolbar (Fig. 3.1), or click **F4**. The window shown in Fig. 3.3 will appear.

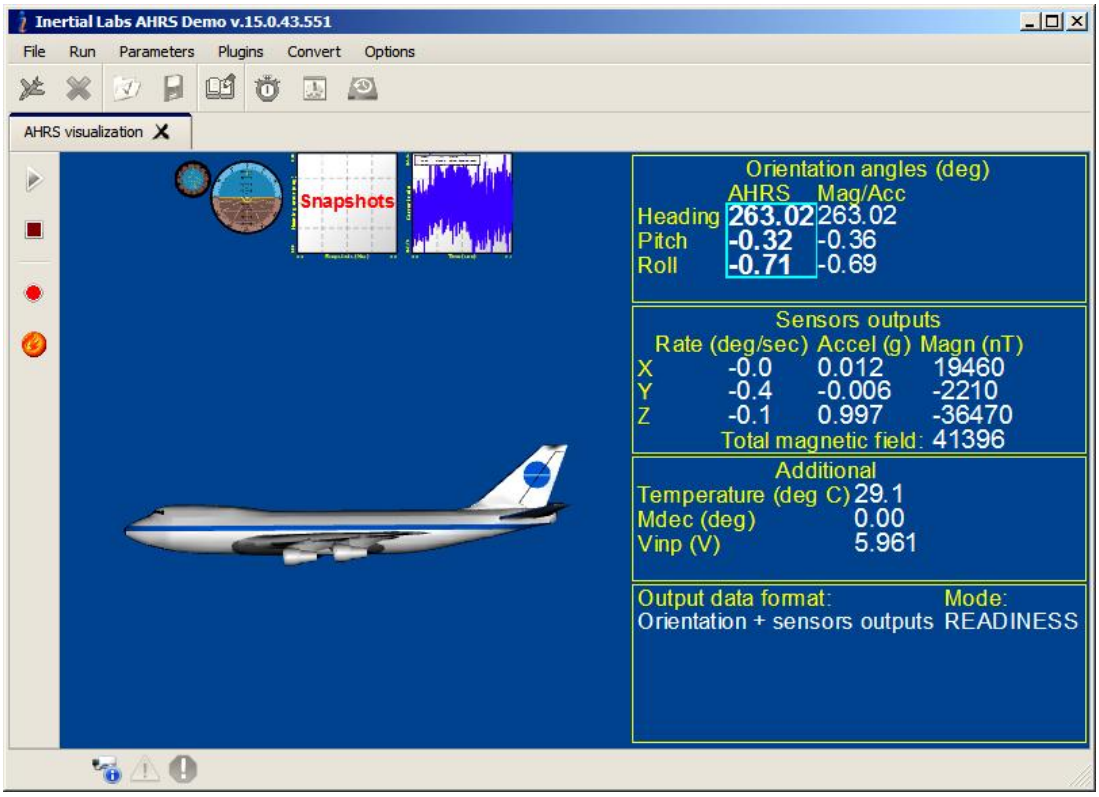

Fig. 3.3

For other styles of visualization of the AHRS outputs there are clickable previews in the upper part of the "AHRS visualization" tab (Fig. 3.4). You can switch to other visualization modes at any time of the AHRS operation by simple clicking on its preview.

a) b) c) d)

Fig. 3.4

- **"Cockpit"** by clicking on preview shown in the Fig.3.4b and window shown in the Fig. 3.5 will appear;
- **"On-the-fly accuracy"** by clicking on preview shown in the Fig.3.4c and window shown in the Fig. 3.6 will appear;
- **"Data graphs"** by clicking on preview shown in the Fig.3.4d and window shown in the Fig. 3.7 will appear.

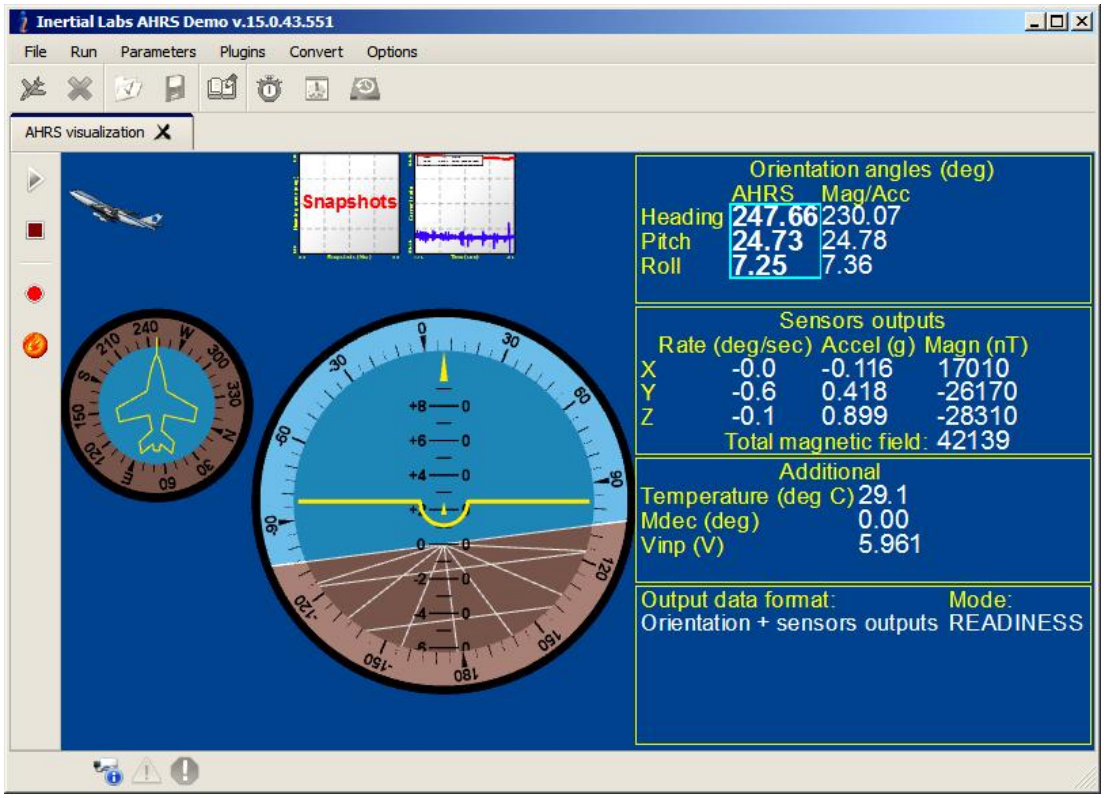

Fig. 3.5

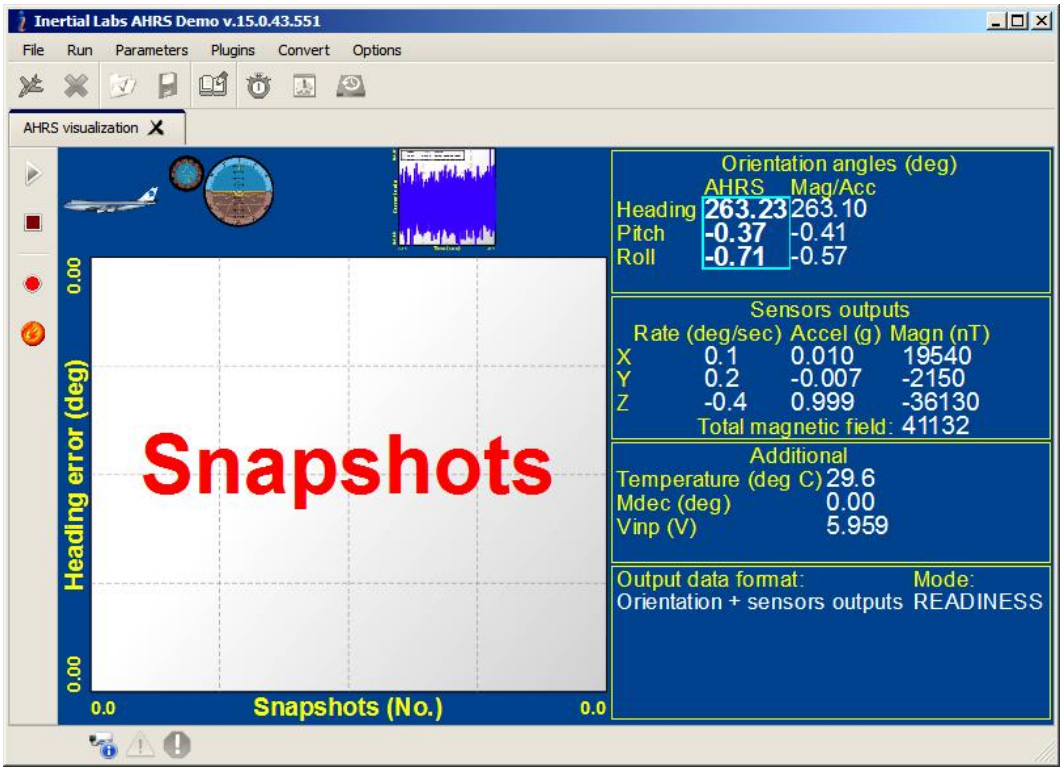
Inertial Labs AHRS Demo v.15.0.43.551
File Run Parameters Plugins Convert Options
AHRS visualization
Orientation angles (deg)
AHRS Mag/Acc
Heading 263.23 263.10
Pitch -0.37 -0.41
Roll -0.71 -0.57
Sensors outputs
Rate (deg/sec) Accel (g) Magn (nT)
X 0.1 0.010 19540
Y 0.2 -0.007 -2150
Z -0.4 0.999 -36130
Total magnetic field: 41132
Additional
Temperature (deg C) 29.6
Mdec (deg) 0.00
Vinp (V) 5.959
Output data format: Mode:
Orientation + sensors outputs READINESS
Snapshots
Heading error (deg)
0.00
0.00
0.0
Snapshots (No.)
0.0

Fig. 3.6

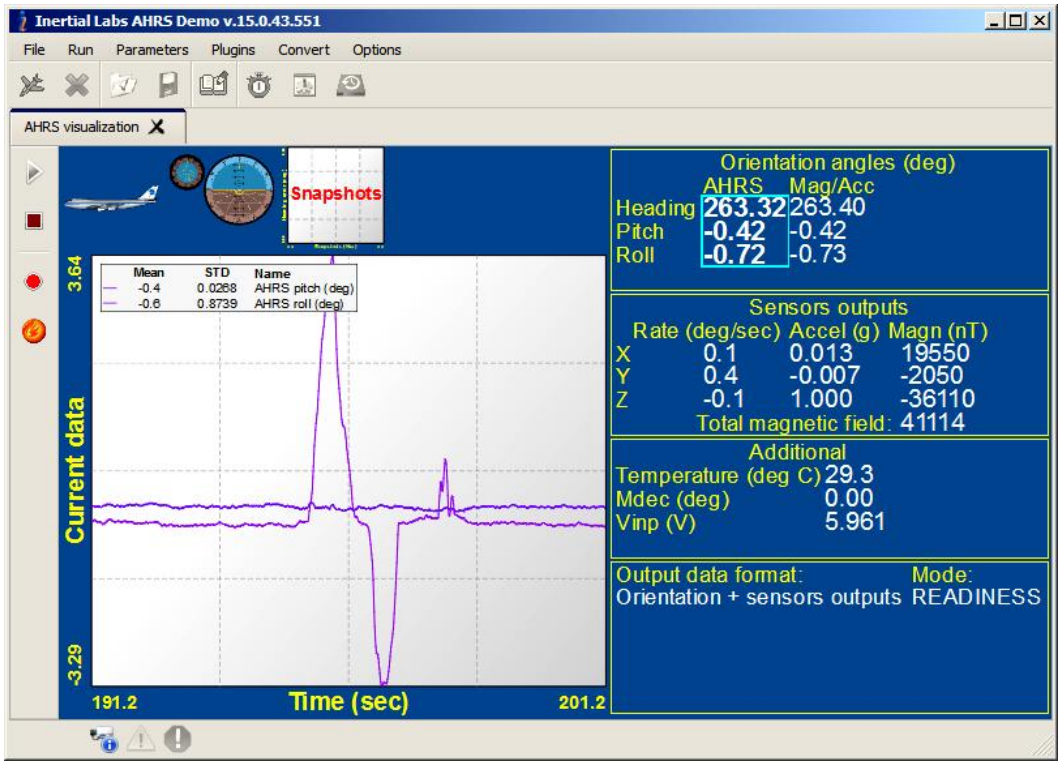
Inertial Labs AHRS Demo v.15.0.43.551
File Run Parameters Plugins Convert Options
AHRS visualization
Snapshots
Mean STD Name
-0.4 0.0268 AHRS pitch (deg)
-0.6 0.8739 AHRS roll (deg)
Orientation angles (deg)
AHRS Mag/Acc
Heading 263.32 263.40
Pitch -0.42 -0.42
Roll -0.72 -0.73
Sensors outputs
Rate (deg/sec) Accel (g) Magn (nT)
X 0.1 0.013 19550
Y 0.4 -0.007 -2050
Z -0.1 1.000 -36110
Total magnetic field: 41114
Additional
Temperature (deg C) 29.3
Mdec (deg) 0.00
Vinp (V) 5.961
Output data format: Mode:
Orientation + sensors outputs READINESS
Current data
3.64
-3.29
191.2
Time (sec)
201.2

Fig. 3.7

Step 6. Click «**Start**» button. Initial alignment of the AHRS will start. This is signified by the message «Initial alignment. Please wait». Also a progress bar of initial alignment will appear in the status line of the main window. During the initial alignment **the AHRS has to be unmovable relative to the Earth**. Once the initial alignment time is over, observe changes in numeric data and graphical evolutions of the object.

If you have selected «On Request» operating mode, click «**Request**» button to get data from the AHRS each time if you want. Observe changes in numeric data and graphical evolutions of the object.

To save data click «**Write**» button. Caption «Data are writing in file!» will appear. Also a progress bar of data writing and timer will appear in the status line of the main window.

In «On Request» operating mode data are written in file sequentially with the each clicking «**Request**» button.

Notes

1. For visual convenience of the AHRS position perception displayed on the monitor and the AHRS real position, it is recommended to place the AHRS in parallel with the monitor before the beginning of work as follows: direct lateral axis X on the monitor and direct longitudinal axis Y in parallel with the monitor on the left.

2. After the AHRS started, the light indicator changes its color from red to green.

3. To allow data sawing the appropriate checkbox should be set in the **«Test Options»** window (see Fig. 3.2).

Step 7. To stop readout and data displaying click «**Stop**» button. After AHRS stopped, the light indicator changes its color from green to red.

Step 8. Repeat Steps 6 and 7 as many times as you need.

4. End work with AHRS

If AHRS operates with data output (light indicator is green), click «**Stop**» button. The light indicator will changed its color from green to red.

At other operations with AHRS, if its light indicator is green, select **«Stop AHRS»** from the **«Run»** menu, or click **F7**, or click button. The light indicator becomes red.

Power-off AHRS and disconnect it from PC COM (or USB) port.

5. Troubleshooting

5.1. How to repair the AHRS parameters

Need to repair of the AHRS parameters appears in some cases, for example at incorrect loading of parameters into the AHRS memory.

You can use original file with .prm extension that comes on CD with the Inertial Labs AHRS, or use own files created by «**Save parameters**» command (if these files contain valid data of course).

Follow next steps to restore AHRS parameters.

1. Connect the AHRS to PC and power it.

2. Start the AHRS Demo program. The main menu will appear (see Fig. 3.1).

3. Select **«Test options…»** from the **«Options»** menu (or click button) – see Fig. 3.2. «Test options» window (Fig. 3.3) will open.

4. Select the correct COM port. Click «**OK**».

Note. For the number of the COM port to which the AHRS is connected, see items «2. Installation of drivers and configuration of the PC parameters».

5. Select **«Restore parameters…»** in the **«Parameters»** menu or click button. A standard Windows «Open» window will open.

6. Select file with extension .prm containing the factory settings of the AHRS parameters or own file created by «**Save parameters**» command (if this file contains valid data of course). Click «**OK**». A message shown in the Fig. 5.1 will appear.

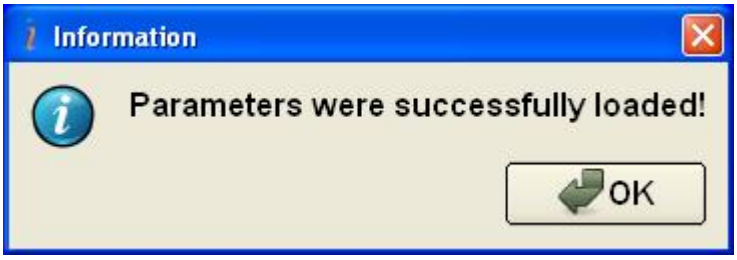

Fig.5.1

Click **"OK"**. Parameters will be loaded into AHRS memory automatically.

5.2. What do you have to do at strange behavior of the AHRS

If you see strange behavior of the AHRS, first check whose parameters are loaded in the connected AHRS. This may occur, for example, if you have restored parameters that corresponds to another AHRS with not proper serial number. Please use **«Restore parameters…»** command accurately to avoid wrong parameters loading into the AHRS's memory.

To check whose parameters are loaded in the connected AHRS please select «**Device options …**» from the **«Options»** menu (or click button) – see Fig. 3.2. «Device options**»** window Fig. 5.2 will open.

In the field **"Device name"** you will see serial number of the AHRS. It must correspond to serial number that is placed on label on AHRS's nose.

If **"Device name"** doesn't correspond to serial number of the connected AHRS then you must restore original parameters as that described in above section.

If **"Device name"** corresponds to the AHRS serial number, but you continue see strange behavior of the AHRS in heading, then this may be due to improper hard/soft iron calibration parameters are loaded into AHRS' memory. To solve this problem see section "8.2. Calibration of the AHRS" of AHRS Demo Program Manual.

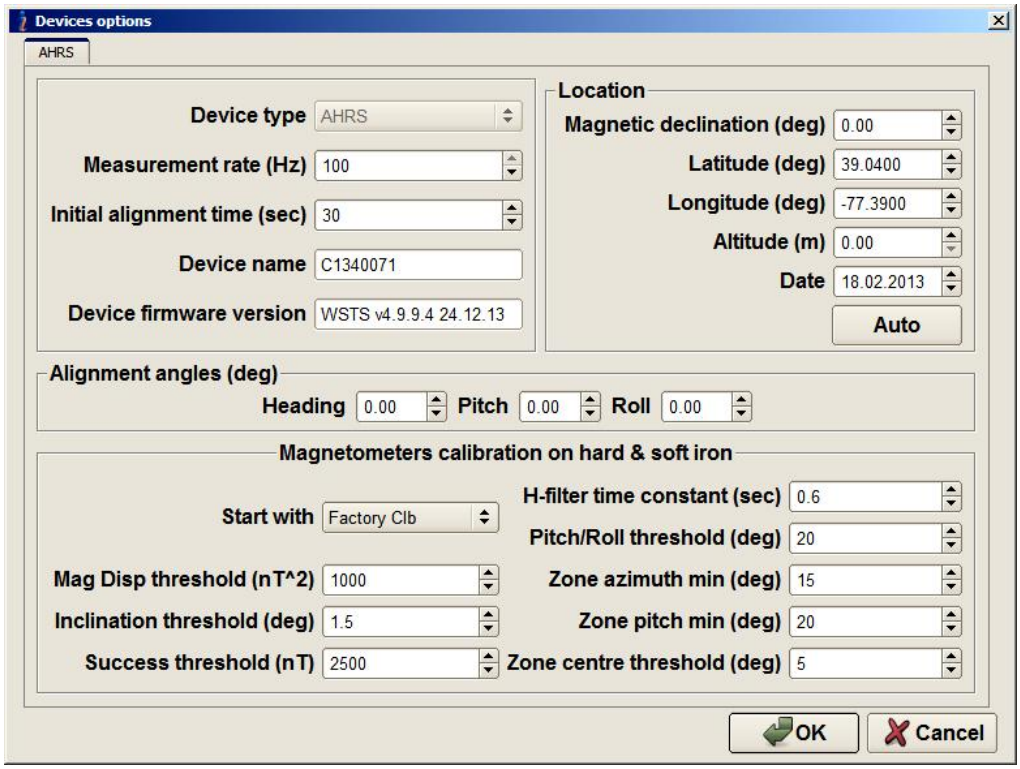

Fig. 5.2

5.3. What do you have to do if messages “Cannot read parameters!”, “Cannot load parameters!”, or “Cannot start AHRS” appear

When you use Inertial Labs AHRS Demo Software, the most of operations are started with reading data from the AHRS nonvolatile memory to control correct AHRS status. For this purpose the AHRS should be powered and connected to COM-port or USB-port using COM-to-USB adapter.

When you see one of messages that Fig. 5.3 shows, then you should check the next items:

- The AHRS is powered and LED indicator on the AHRS case lights red.
- The AHRS is connected to COM-port or USB-port using COM-to-USB adapter.

- The number of COM-port is set correctly in the **«Serial port»** field in **«Test options…»** window from the **«Options»** menu as Fig.3.2 shows.

Then simply click «**OK**» button and repeat your operation.

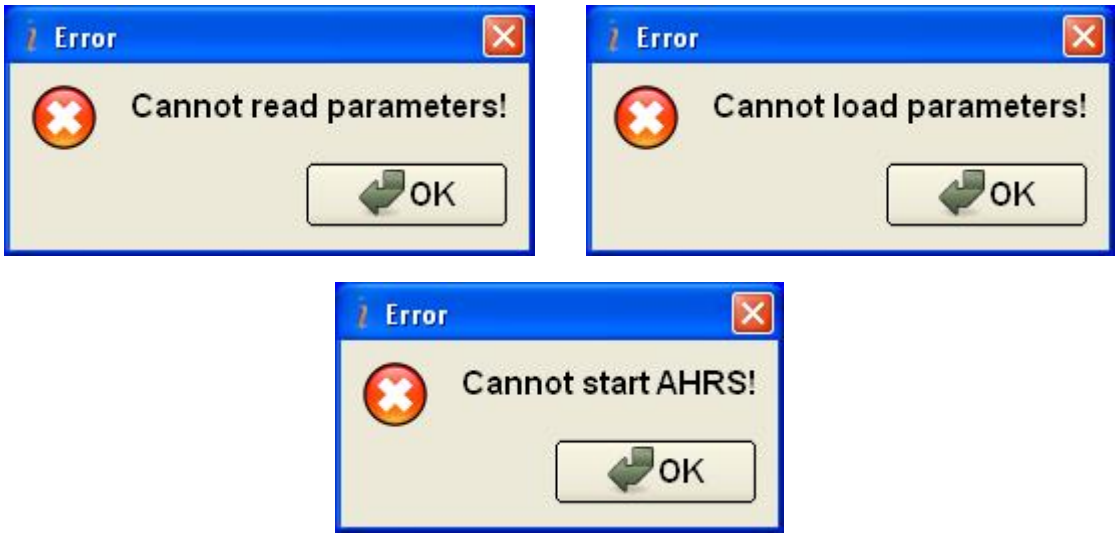

Fig. 5.3

Also above messages (Fig. 5.3) may appear if you want to do some operations with the AHRS but it was not stopped after previous work. In this case previous program continues its work in AHRS microprocessor and light indicator in AHRS is green. Simply click  button to stop program in AHRS (light indicator will be red).

APPENDIX A.
Installation of the COM-to-USB converter drivers

If connection of the AHRS to a computer is done through a USB port, it is necessary to install a COM-to-USB converter driver. The converter driver is in the folder COM_to_USB_Driver placed on the CD provided with the AHRS. Sequence of the converter driver installation is as follows:

– Connect the converter to a computer. The computer automatically starts a search and installation program for the necessary drivers of the connected device. A window (Fig. A.1) opens. Select «**No, not this time**» from the menu and click on the «**Next**» button.

Fig. A.1

– Window (Fig. A.2) will appear on the display. Select «**Install from a list or specific location (Advanced)**» from the menu and click on the «**Next**» button.

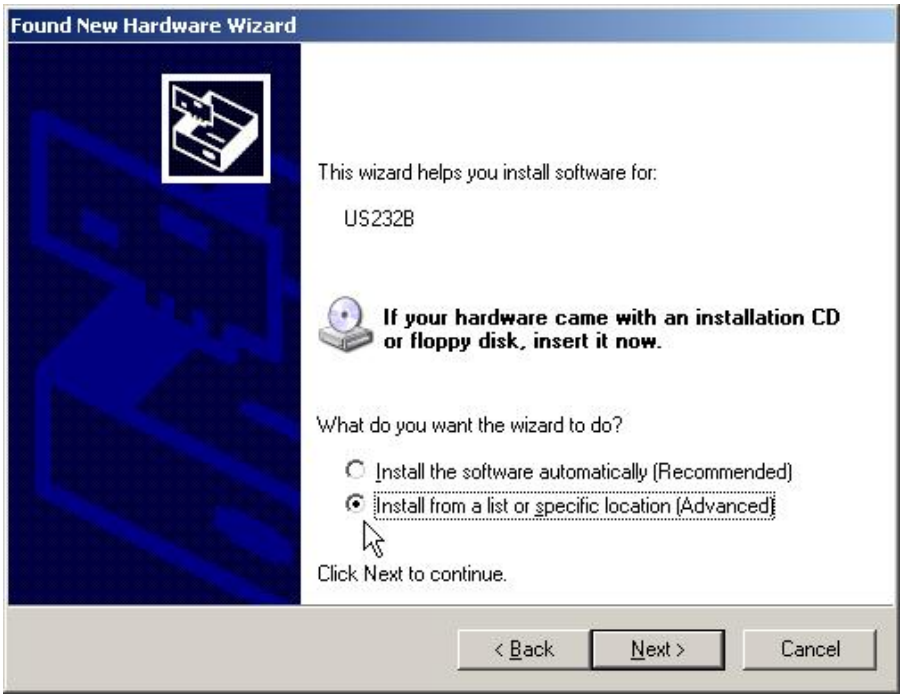

Fig. A.2

– Window (Fig. A.3) will appear on the display. Check «**Include this location in the search:**» and click on «**Browse**». Show the path to the converter drivers folder in the window (Fig. A.4) which appears on the top of the previous one (folder name may differ from the name in Fig. A.4) and click «**OK**» (if a folder containing no driver files is selected, «**OK**» button will remain inactive). Next, in the window Fig. A.3, which will be looking like the window in Fig. A.5, a path will be defined. Using this path the installation program will search for the necessary converter driver. Press «**Next**» to continue installation.

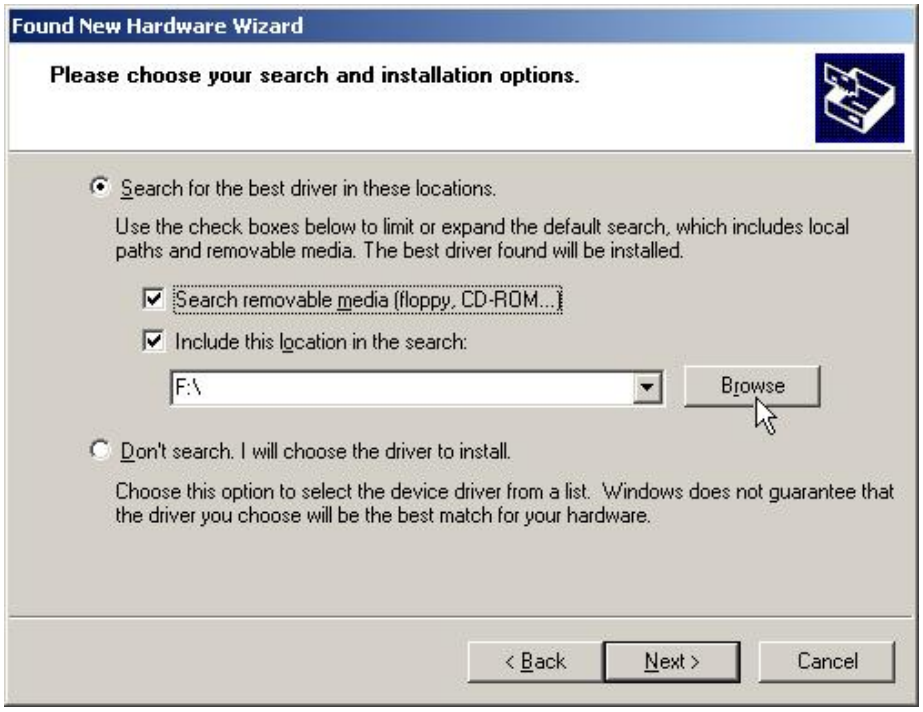
Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
F:\
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

Fig. A.3


Browse For Folder
Select the folder that contains drivers for your hardware.
My Documents
My Computer
Local Disk (C:)
DVD Drive (D:)
Innalabs_iAHRS (E:)
COM_to_USB_Driver
Documentation
Innalabs_AHRS_Demo_Program
To view any subfolders, click a plus sign above.
OK
Cancel

Fig. A.4

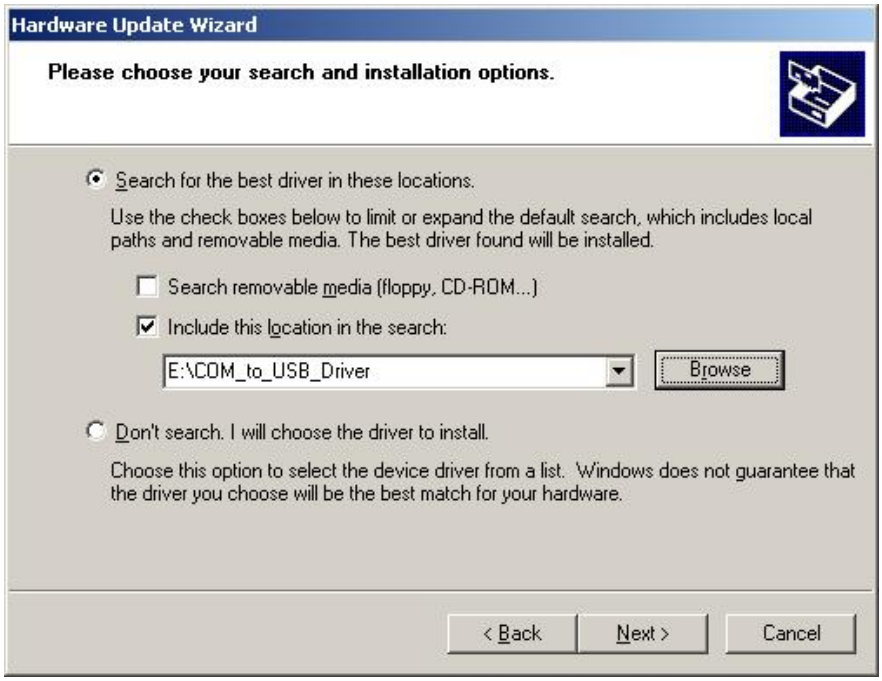

Fig. A.5

– If the program finds the necessary files, it will automatically start the driver installation. If installation is completed successfully, the window in Fig. A.6 will appear on the screen. Press «**Finish**» to complete installation procedure for the COM-to-USB converter driver.

Fig. A.6

If the necessary drivers are not installed, an error message (Fig. A.7) will appear. In this case, click «**Back**» and set the correct path to the driver files in the window in Fig. A.3.

Fig. A.7

APPENDIX B.
Checking and configuration of COM-port to which the AHRS is connected

To know the number of the additional PC COM port, press the «**Device Manager**» button in the «System Properties» window (Fig. B.1), in the «**Hardware**» page. In the opened «Device Manager» window (Fig. B.2) the additionally set COM-port will be marked as «**USB serial port (COMN)**». Number N in the port name will be assigned by the computer.

Fig. B.1

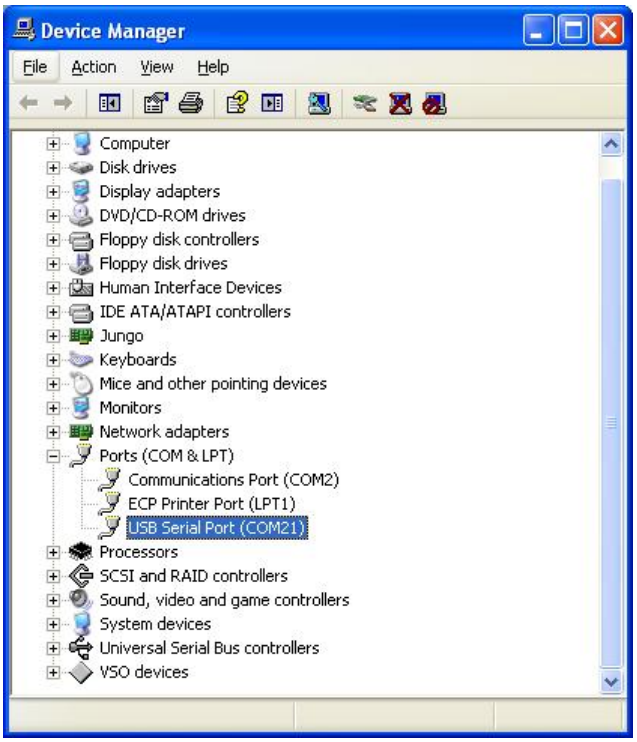

Fig. B.2

Next, open the Properties window of this port «USB serial port (COMN) Properties» (Fig. B.3) and press the «**Advanced**» button. In the opened «Advanced Settings for COMN» window set the parameters:

- Latency Timer (msec) to **16**;
- Minimum Read Timeout (msec) to **0**;
- Minimum Write Timeout (msec) to **0**;

as it is shown in Fig. B.4, and click «**OK**».

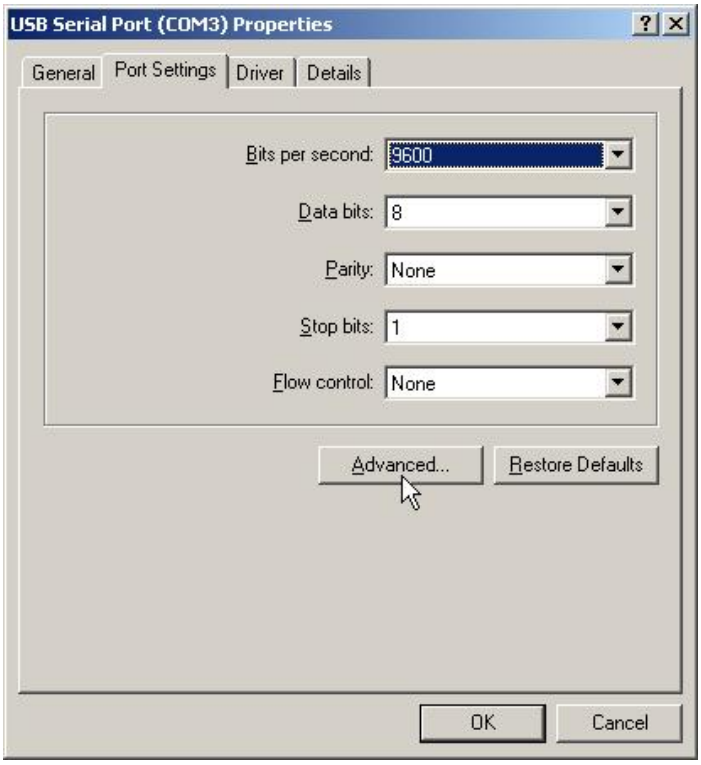
USB Serial Port (COM3) Properties
General
Port Settings
Driver
Details
Bits per second: 9600
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None
Advanced...
Restore Defaults
OK
Cancel

Fig. B.3

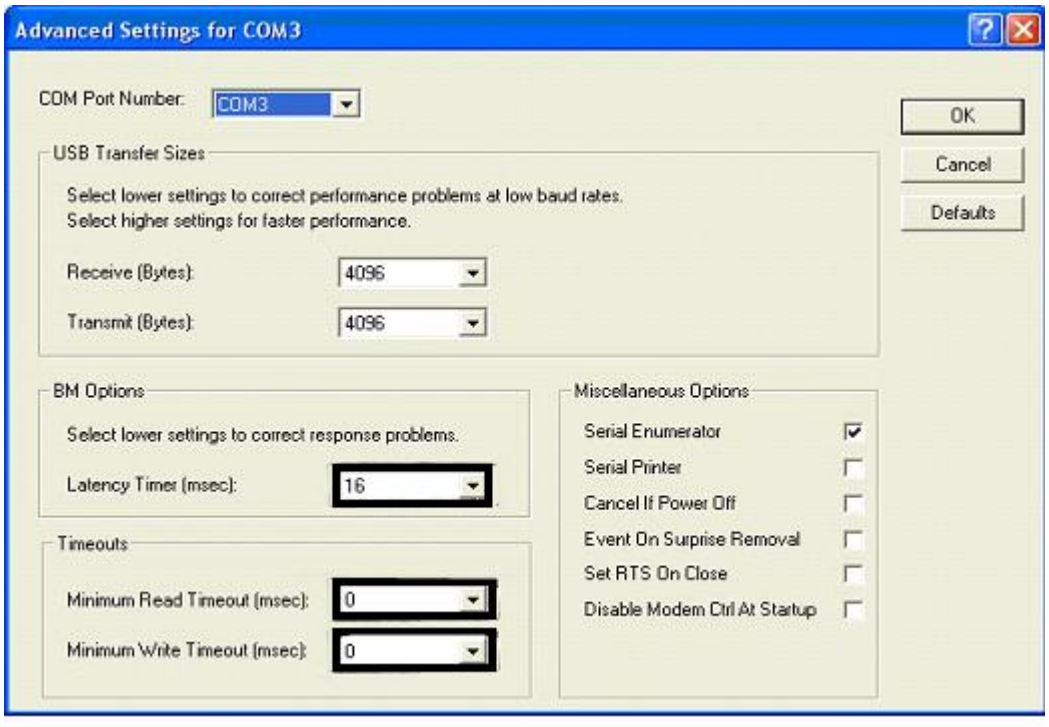
Advanced Settings for COM3
COM Port Number: COM3
OK
Cancel
Defaults
USB Transfer Sizes
Select lower settings to correct performance problems at low baud rates.
Select higher settings for faster performance.
Receive (Bytes): 4096
Transmit (Bytes): 4096
BM Options
Select lower settings to correct response problems.
Latency Timer (msec): 16
Timeouts
Minimum Read Timeout (msec): 0
Minimum Write Timeout (msec): 0
Miscellaneous Options
Serial Enumerator
Serial Printer
Cancel If Power Off
Event On Surprise Removal
Set RTS On Close
Disable Modem Ctrl At Startup

Fig. B.4

In the case of problems in COM-to-USB driver operation please make one more adjustment of the driver. In the «Device Manager» window (see Fig. B.2) go to the «Universal Serial Bus controllers» section, item «USB Serial Controller» (see Fig. B.5). Twice click on this item to set its properties. The window «USB Serial Controller Properties» will be opened where go to «Advanced» tab and check «Load VCP» box (see Fig. B.6).

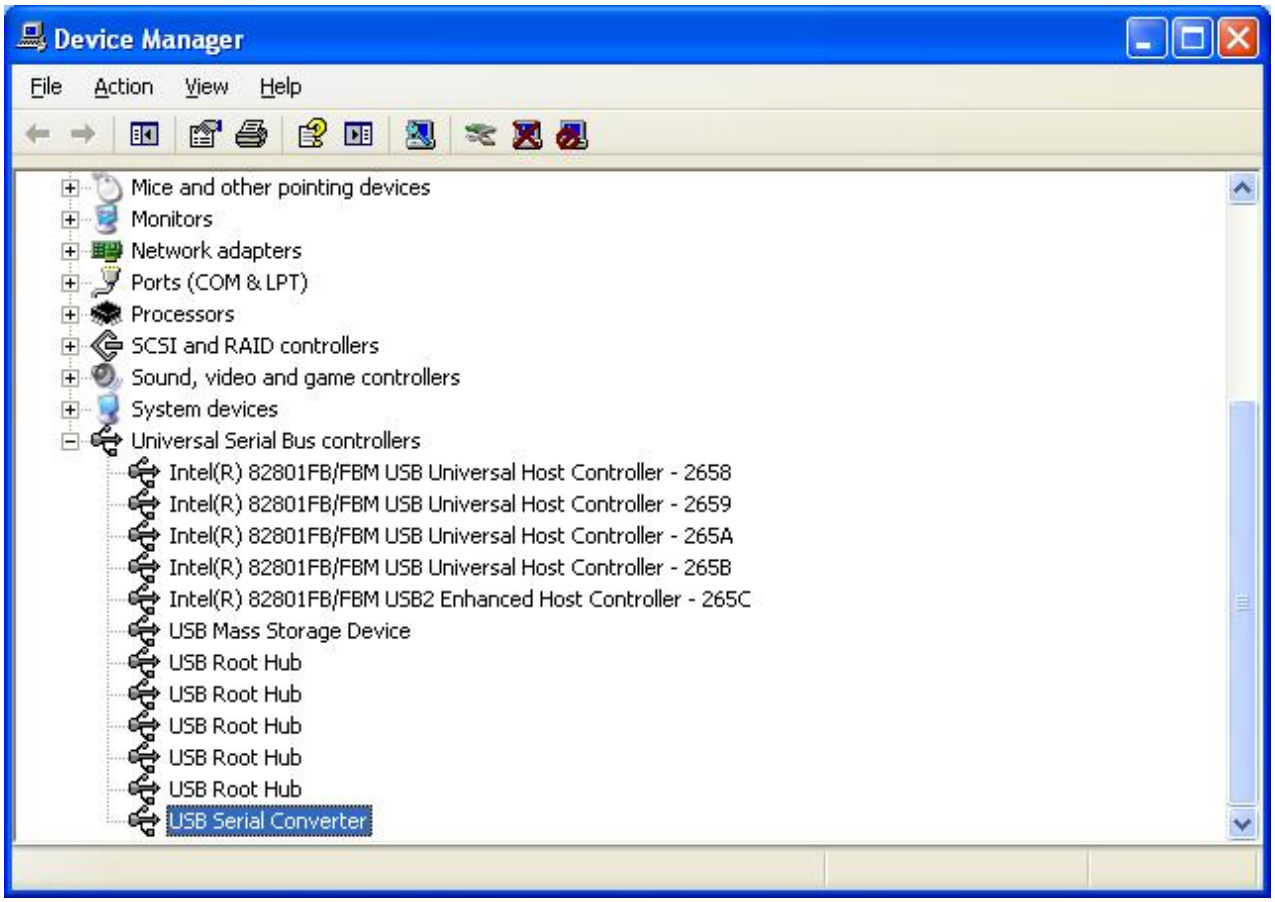

Fig. B.5

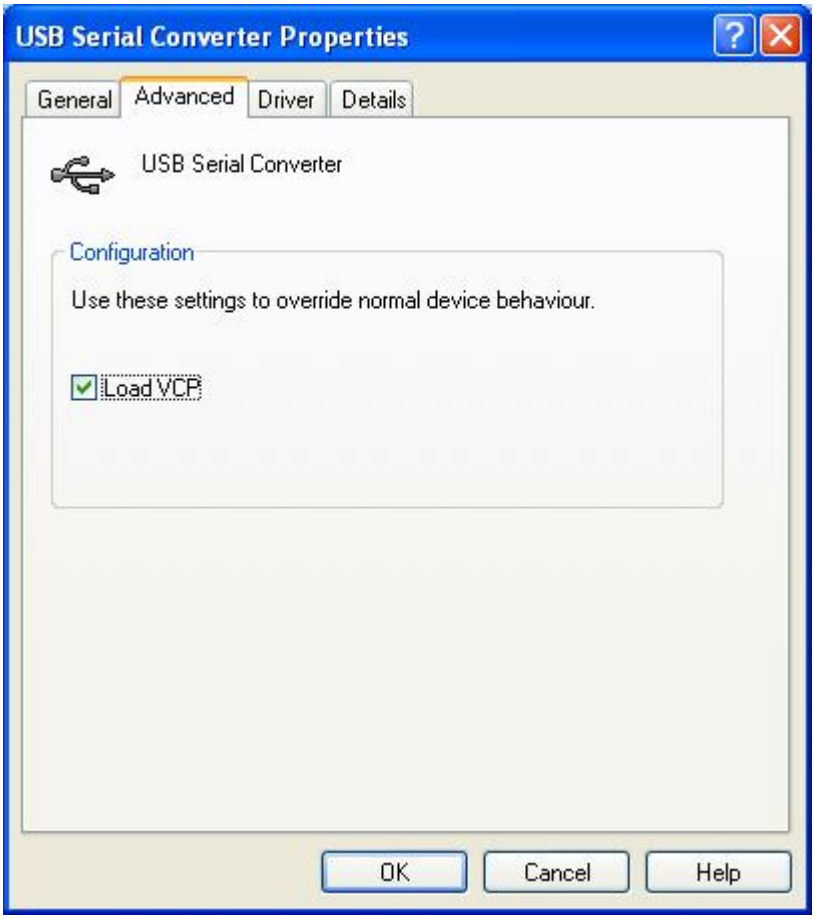
USB Serial Converter Properties
General
Advanced
Driver
Details
USB Serial Converter
Configuration
Use these settings to override normal device behaviour.
Load VCP
OK
Cancel
Help

Fig. B.6