

**AmbioMote24
Configuration Utility
Manual rev 1.0**

**© 2007 AmbioSystems LLC
December 23, 2007**



Table of Contents

1 INTRODUCTION.....	3
AmbioMote24 Description.....	3
2 AMBIOMOTE24 CONFIGURATION UTILITY.....	4
2.1 Getting started.....	4
2.2 Windows driver installation.....	4
2.3 Configuration utility installation.....	7
2.4 Sensor configuration.....	8
2.4.1 Read current sensor configuration.....	8
2.4.2 Set sensor type.....	9
2.4.3 Energy harvesting configuration.....	10
2.4.4 Radio configuration	11
2.4.5 Writing configuration.....	12
2.5 Coordinator configuration.....	13
2.5.1 Read coordinator configuration.....	14
2.5.2 Interface configuration.....	14
2.5.3 Radio configuration.....	14
3 Troubleshooting.....	15
3.1 Operations using the serial port are slow.....	15
4 Revision history.....	15
IMPORTANT NOTICE.....	16

1 INTRODUCTION

AmbioMote24 Description

AmbioMote24 is an all-in-one platform for building self-powered wireless sensor in energy harvesting applications. AmbioMote24 operates from the power generated by ambient energy such as energy of vibration.

Key features of AmbioMote24 include:

- Operates without batteries powered by ambient energy.
- Several configurations: AmbioMote24A is targeted for very low power applications. Intelligent control of energy conversion in AmbioMote24B provides up to 400% energy gain in certain configurations¹
- User-configurable power management options
- High-speed 2Mbps data link
- 2.4Ghz frequency band for license-free worldwide operation
- 61 frequency channels ensure coexistence of multiple AmbioMote networks and other devices
- Long transmission range (up to 80m in open air with a rubber duck antenna) ensures wide area coverage
- Variety of preconfigured sensors: temperature, humidity, light, acceleration, barometric pressure, etc.
- User-configurable 10-bit ADC, GPIO, I²C, SPI

The flexibility of configuration and customization is provided by a configuration utility that is used to select operating parameters and update firmware.

This manual describes operation of the configuration utility for Windows XP. The utility is a Java application that can also be executed on other operating systems, including Linux. Support for operating systems other than Windows does not come standard with a purchase of AmbioSystems products.

¹ Energy gain compared to a simple rectification circuit

2 AMBIOMOTE24 CONFIGURATION UTILITY

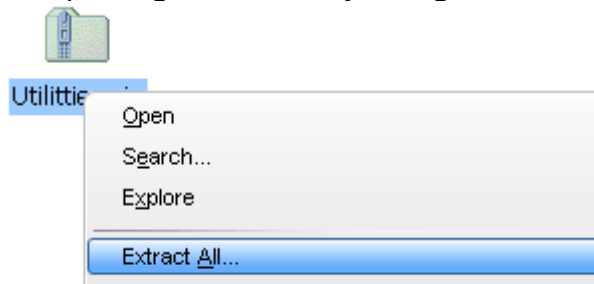
2.1 Getting started

To start using the configuration utility, you will need the following items:

- USB interface board for AmbioMote24 (SKU: USB-00001)
- 5 pin miniUSB cable
- Serial USB drivers for the USB interface board. Available on AmbioSystems Web site.
- Configuration utility software. Available on AmbioSystems Web site
- AmbioMote24-A or AmbioMote24-B (SKU: AMB-00001-221A or AMB-00001-221B)

2.2 Windows driver installation

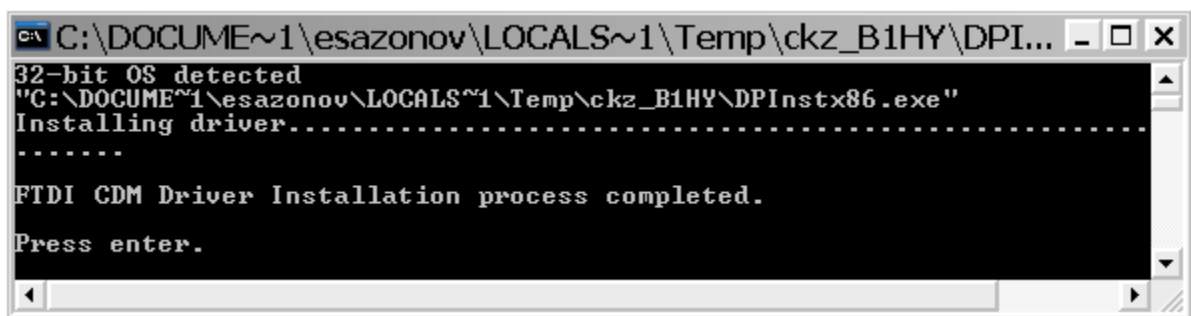
Unpack the distribution package *Utilities.zip* using Windows.



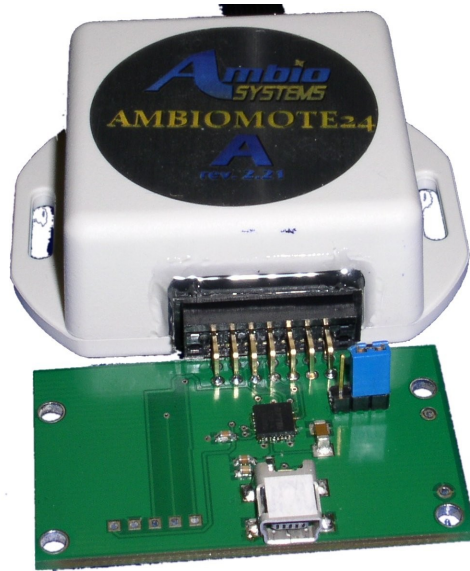
Open *Drivers* subdirectory and locate USB driver.



Double click on the driver file to start installation and wait for installation to complete

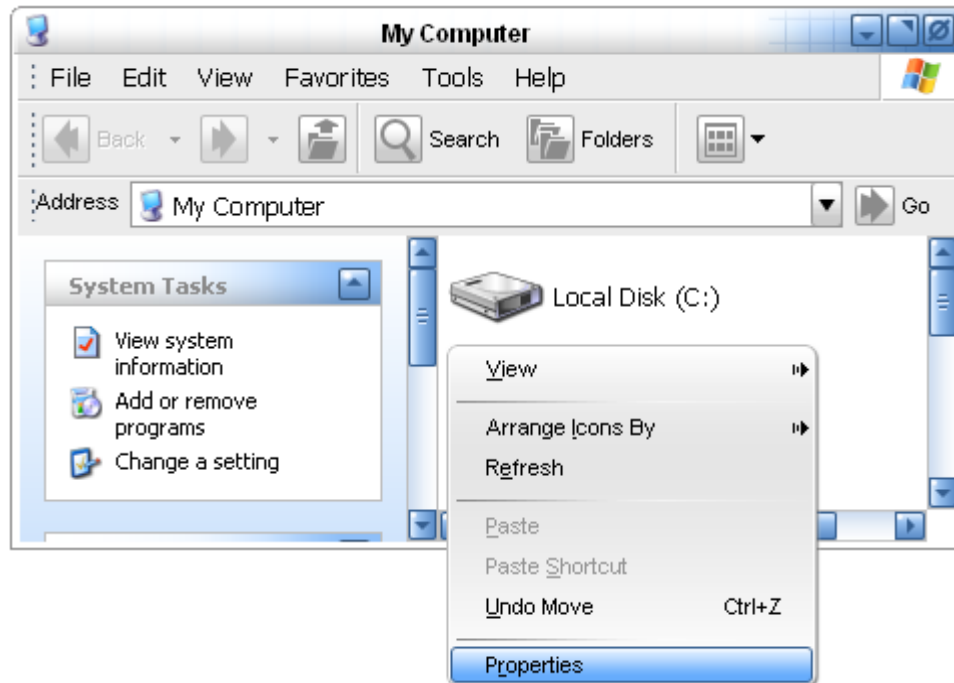


Connect USB adapter board to the AmbioMote24. Make sure that the function selection jumper is in **Program** position.



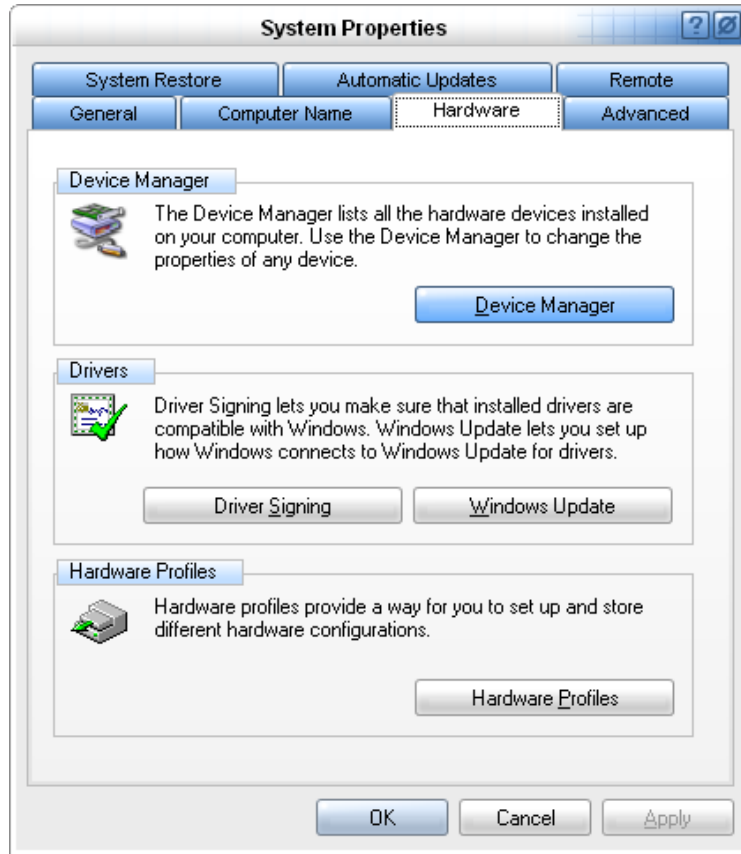
Connect the miniUSB cable to the USB adapter board and to a USB port on a computer. Windows will identify new hardware and install drivers.

After receiving a prompt that driver installation is complete, right click on **My Computer** and select **Properties**.

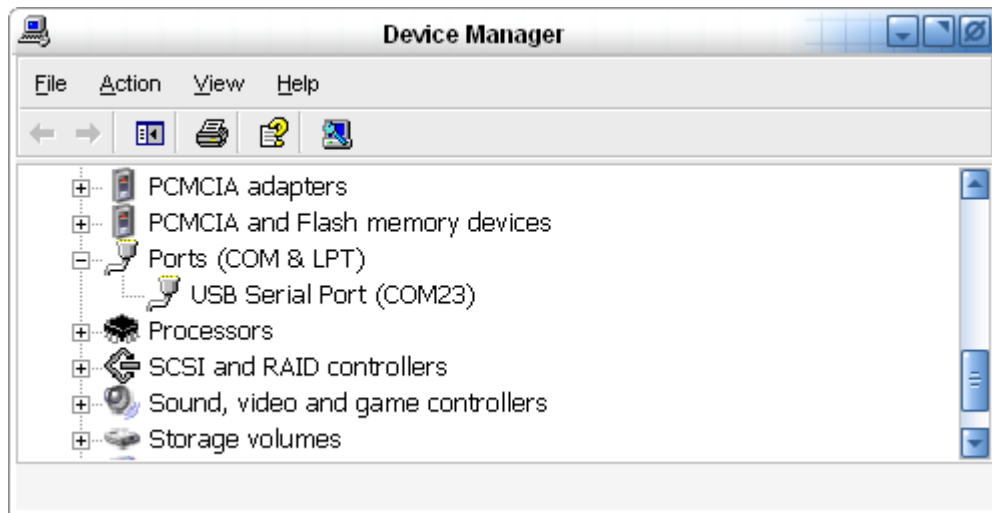


|

In the **System Properties** window, select **Hardware** tab and click on **Device Manager** button.



In the **Device Manager** window, scroll down and unroll **Ports (COM & LPT)**



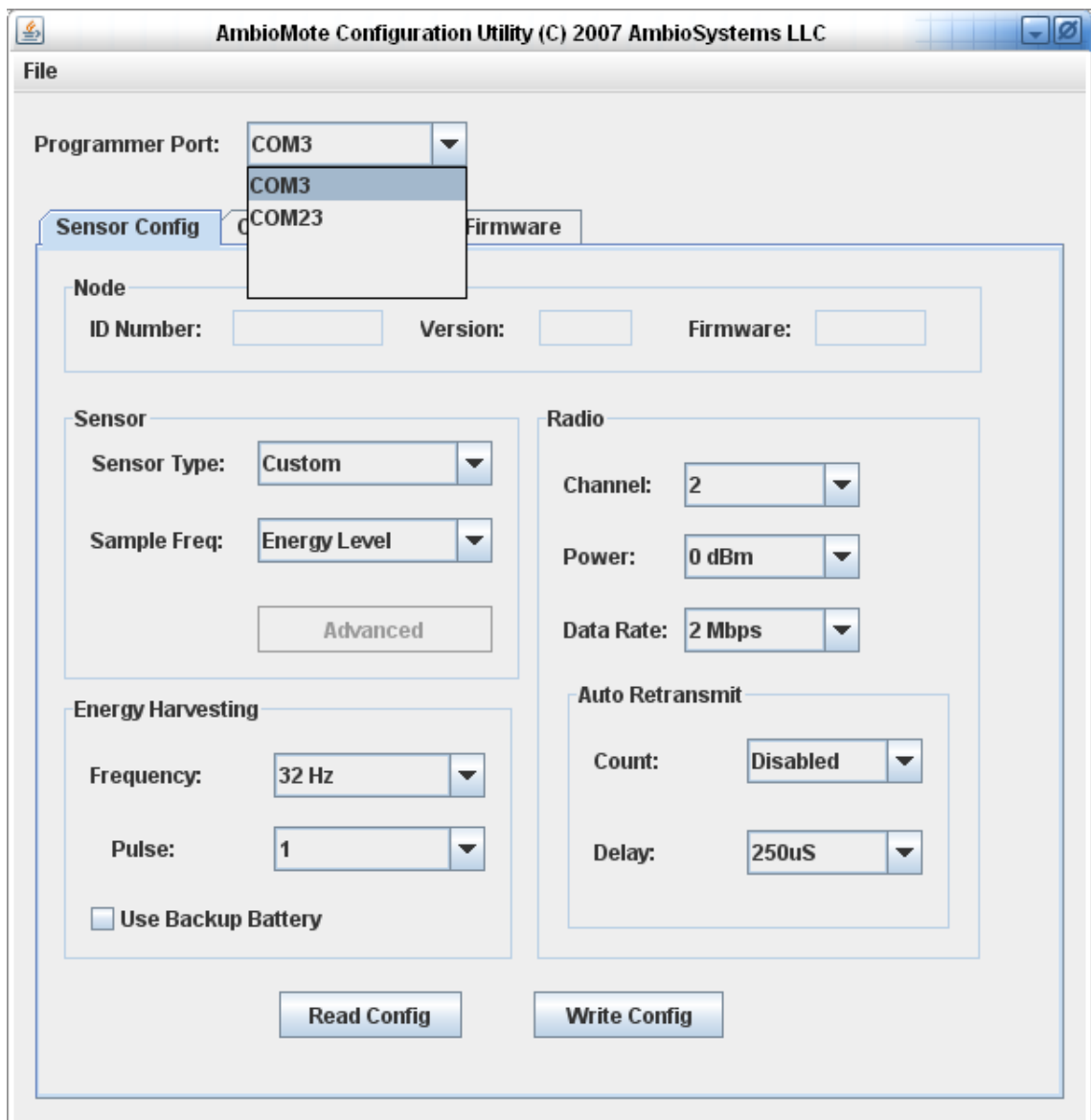
Take a note of the COM port number for **USB Serial Port**. This is the port that will be used by configuration utility.

2.3 Configuration utility installation

The configuration utility is located in the Utilities directory. To start the configuration utility double click on the icon



The utility will start and open a new program window. Click on the down arrow of the **Programmer Port** list box. The program will scan for available COM ports and display them in a list. Choose the port associated with the USB-serial adapter. The utility is ready for use.

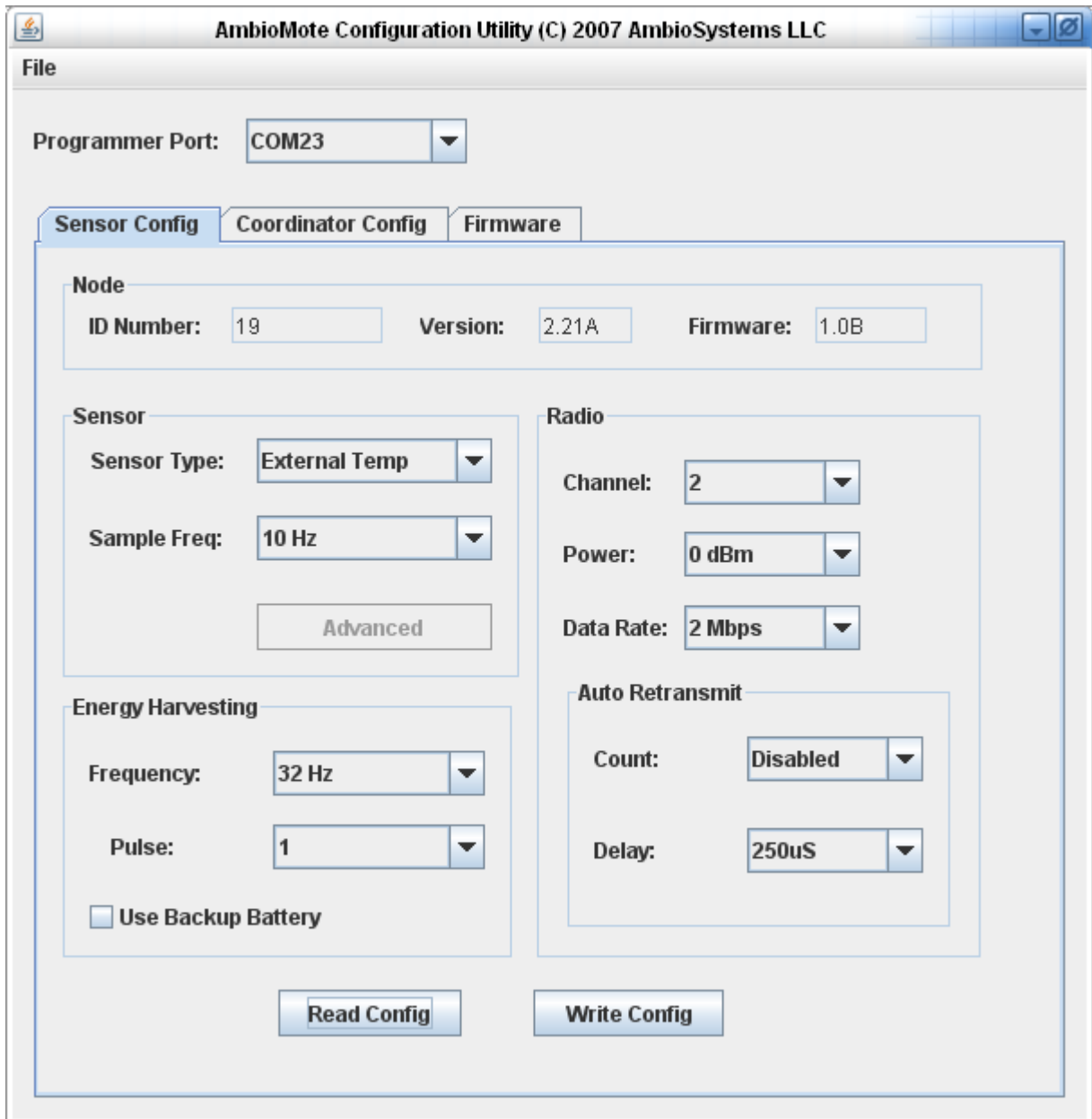


2.4 Sensor configuration

Sensor configuration is performed in **Sensor Config** tab of the utility.

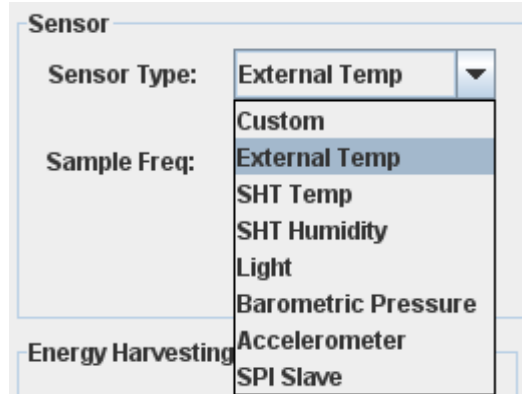
2.4.1 Read current sensor configuration

Press **Read Config** button. The window will update showing the current configuration, sensor ID, sensor version and firmware version.



2.4.2 Set sensor type

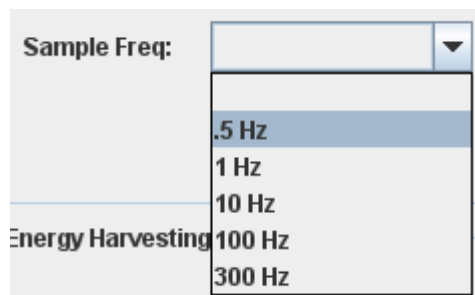
To use the AmbioMote with a different type of sensor, select desired sensor type in the drop-down list box.



Available choices are:

1. External Temp – analog temperature sensor (SKU: SENS-00001)
2. SHT Temp – digital temperature sensor (SKU: SENS-10001)
3. SHT Humidity – digital humidity sensor (SKU: SENS-10001)
4. Light – analog ambient light sensor (SKU: SENS-00002)
5. Barometric pressure – digital barometric pressure sensor (SKU: SENS-10002)
6. Accelerometer – analog 3D accelerometer (SKU: SENS-00003)
7. SPI slave – use as a high-speed SPI extension

Each sensor has the following options under **Sample Freq.** The number here specifies the sampling frequency at which data will be acquired once the AmbioMote builds enough energy in storage. The data acquisition will continue until storage depletes. AmbioMote goes into a low-power mode between consecutive samples therefore harvested energy may sufficient for continuous operation.



Some sensor types have **Advanced** button enabled to display additional parameters. For example the accelerometer sensor allows to choose which channels to sample.

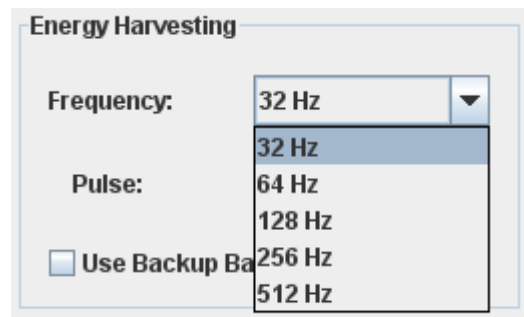


2.4.3 Energy harvesting configuration

Energy harvesting configuration is only applicable to AmbioMote24-B and has no effect on AmbioMote24-A.

Energy harvesting allows to maximize energy utilization under specific excitation conditions. The following parameters are available:

1. Conversion frequency. Higher conversion frequency will produce better results for high-level excitations while lower conversion frequency will produce better results for lower-level excitations



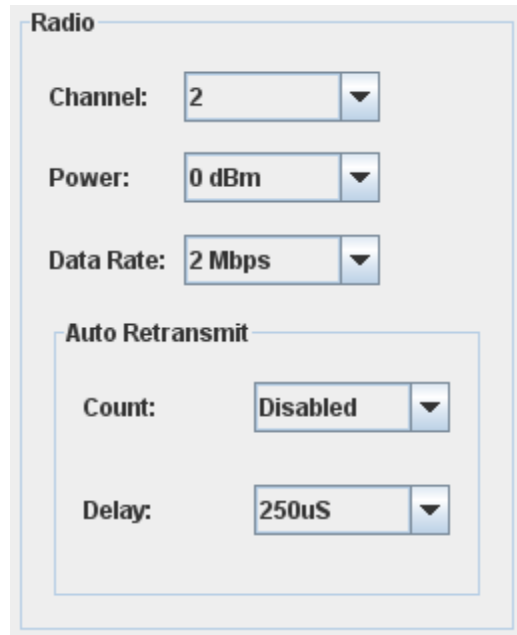
2. Pulse length. Longer pulse is better for high-energy applications and high-energy power sources. Shorter pulse is better for low-energy power sources.

3. Use of backup battery. Check this option if you plan on using a backup battery for mission-critical applications.

2.4.4 Radio configuration

Radio configuration allows to select the following parameters:

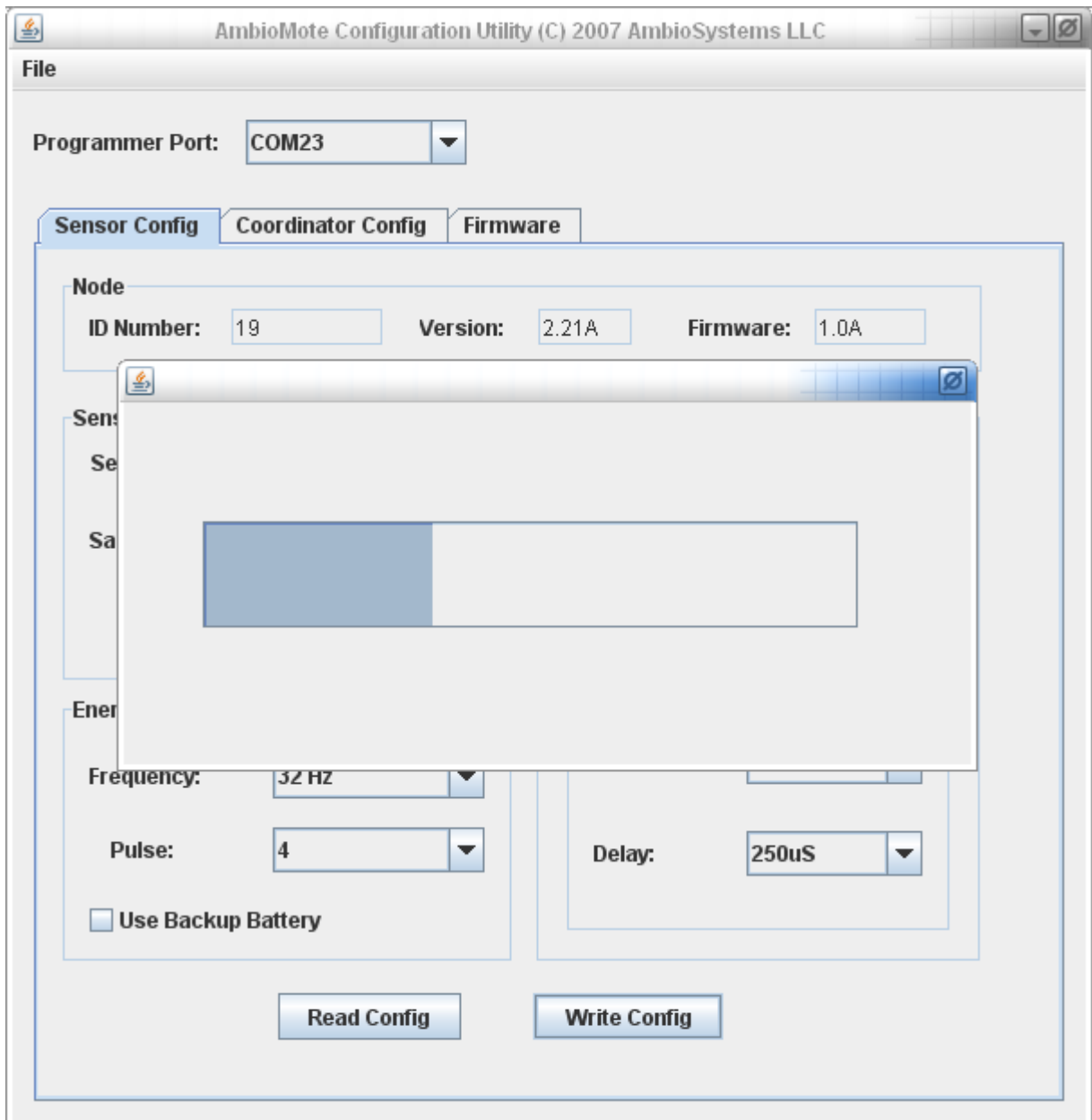
1. Frequency channel. Use the list box to select an available frequency channel. All the sensors must be on the same frequency channel as the coordinator. You can have multiple coordinators (and sensor networks) located on different frequency channels.
2. Output power. Set 0dbm for maximum range or reduce power for energy savings.
3. Data rate. Choose between 1Mbps and 2Mbps. We recommend 2Mbps operation. Note: Using 2Mbps requires 2 channels of bandwidth, this requires networks to be separated by 1 channel. e.g. channels 2, 4, 6 could be used to setup three 2Mbps networks.
4. Auto retransmit - Count. Enable automatic retransmissions of failed RF packets. The count specifies number of retransmission attempts.
5. Auto retransmit – Delay. Delay between retransmission attempts.



The screenshot shows a configuration window titled "Radio". It contains several dropdown menus for setting radio parameters. The "Channel" is set to 2, "Power" is set to 0 dBm, and "Data Rate" is set to 2 Mbps. Below these, there is a sub-section titled "Auto Retransmit" which contains two more dropdown menus: "Count" is set to Disabled, and "Delay" is set to 250uS.

2.4.5 Writing configuration

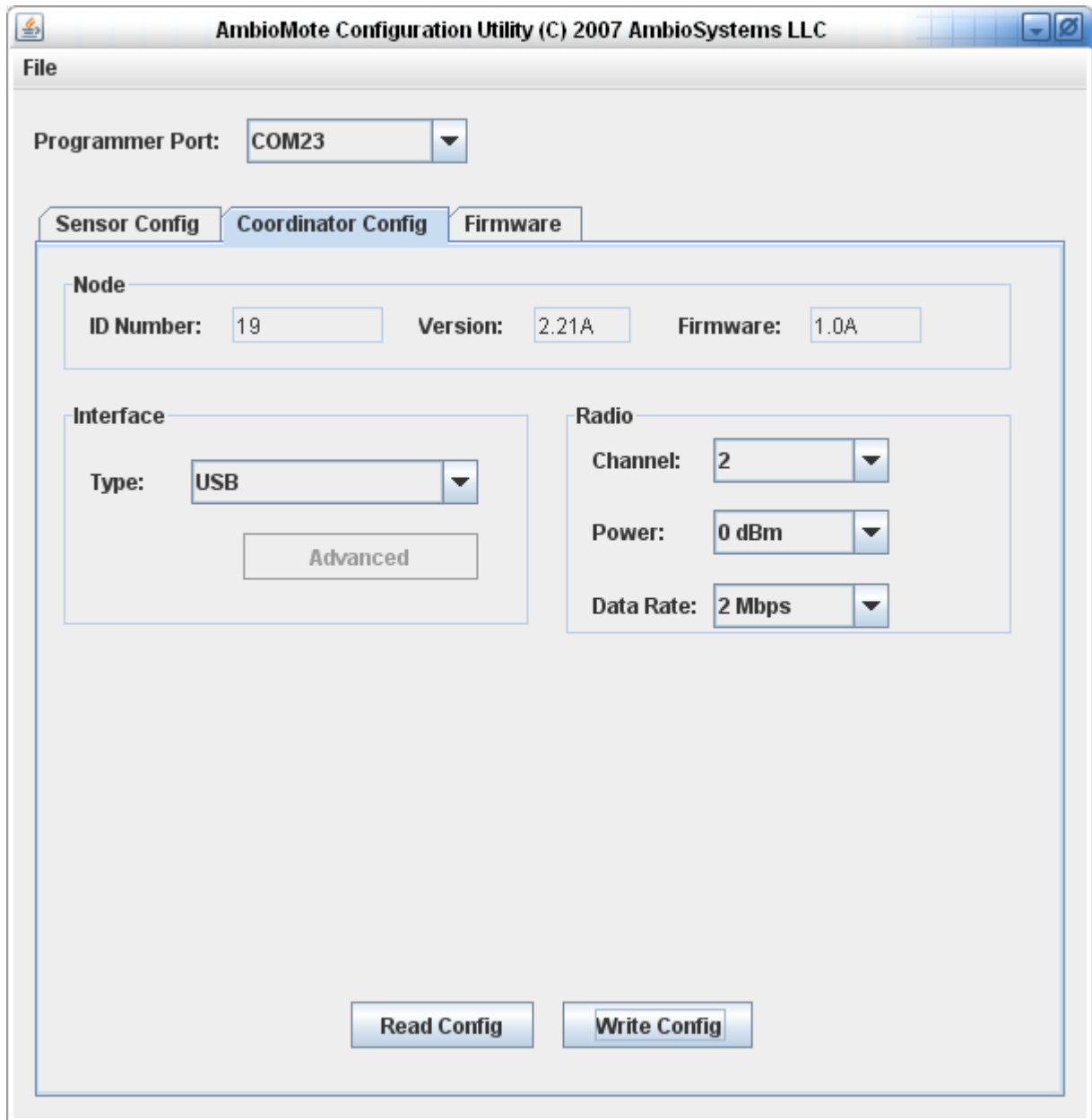
After making any kind of changes in sensor configuration they need to be written into the AmbioMote. Click **Write Config** and wait for the programming to complete. Interrupting the programming process may lead to firmware corruption.



2.5 Coordinator configuration

To use an AmbioMote24 as a coordinator (receiver) it must be properly configured and programmed.

Coordinator configuration is available in **Coordinator Config** tab.



2.5.1 Read coordinator configuration

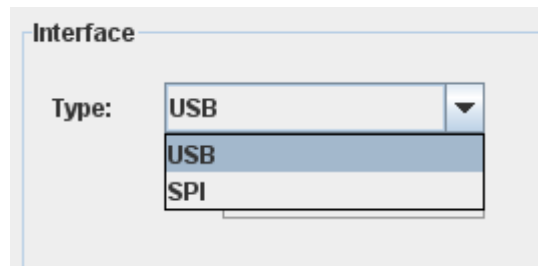
To read coordinator configuration, click **Read Config**. The screen will be updated with current configuration.

2.5.2 Interface configuration

A coordinator supports two modes (USB/SERIAL) and SPI.

In USB mode the data are sent over the asynchronous serial link from AmbioMote24 to the serial-to-USB adapter. On the personal computer side the data can be accessed by reading from the corresponding virtual serial port.

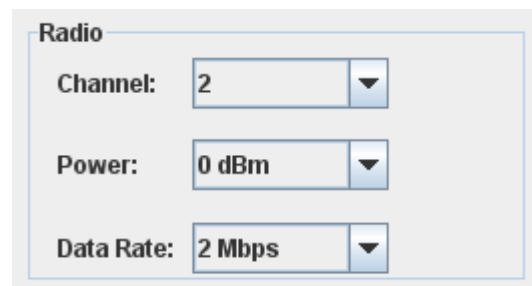
In SPI mode all received data are forwarded to the SPI interface. In combination with SPI slave sensor configuration this mode can be used as a high-speed wireless SPI extension.



2.5.3 Radio configuration

Radio configuration allows setting of the same basic parameters as for the sensors.

The coordinator acknowledges all incoming packets, therefore it is recommended to have all coordinators within the reception range on a separate channel.



3 Troubleshooting

3.1 Operations using the serial port are slow.

Scanning the ports, reading and writing the config may be slow on some computers with a Bluetooth adapter. Some software stacks create an excessive number of Bluetooth serial ports that may interfere with RXTX protocol. Temporarily disabling the Bluetooth adapter should solve the problem.

3.2 The energy source is providing enough power, but I get sensor readings every 1-2 seconds

AmbioMote configuration specifies the sampling frequency at which data will be acquired. If the configuration specifies 1Hz sampling rate, the AmbioMote will not acquire more data even if additional energy is available. Change the configuration as described in this document.



4 Revision history

07-12-23

- reflect modifications of the EH configuration
- add troubleshooting of low sampling frequencies
- add revision history

07-12-13

- original document



IMPORTANT NOTICE

AmbioSystems LCC reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

AmbioSystems does not warrant or represent that any license, either express or implied, is granted under any AmbioSystems patent right, copyright, mask work right, or other AmbioSystems intellectual property right relating to any combination, machine, or process in which AmbioSystems products or services are used. Information published by AmbioSystems regarding third-party products or services does not constitute a license from AmbioSystems to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from AmbioSystems under the patents or other intellectual property of AmbioSystems.

Reproduction of AmbioSystems information in AmbioSystems data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. AmbioSystems is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

This document describes confidential computer software. Valid license from AmbioSystems is required for possession, use or copying.