Introduction
Thank you for purchasing UltraSoundGate 416. This device allows high-speed data acquisition at sampling rates of up to 750 kHz. In conjunction with the accompanying software Avisoft-RECORDER USG, sound-activated direct-to-disk recording and real-time spectrogram display is supported. The integrated high-quality analog-to-digital converter with adaptive anti-aliasing filter provides best performance. The trigger button supports remote-controlled harddisk recording. The rugged and compact design and the USB interface make this device the optimal choice for portable ultrasound recording in the field.

Installation procedure

Hardware Installation
Simply connect the UltraSoundGate to an USB port. An USB Audio Device and a HID device will be detected automatically. On the device, the green POWER LED should light and the amber LED labeled REC should flash once it is connected to the PC. There is no further user-interation required. Only in Windows 98, the Add New Hardware Wizard dialog box will appear and you should follow the the instructions. To check, whether the device has successfully been installed you may go to “Start->Settings->Control Panel->System->Device Manager”. Check the “USB Audio Device” under “Sound, video and game controllers” and the “Input devices (Human Interface Device)”. There should appear an “USB-HID (Human Interface Device)” representing the trigger button.

Software installation
If you have also purchased the recording software “Avisoft-RECORDER USG”, that is required to use the trigger button, you will need to install the Avisoft software from the accompanying CD-ROM. In Windows 2000 and XP you have to log on as Administrator. The installation program setup.exe (which usually starts automatically) will install both the Avisoft-RECORDER and the SASLab Pro software.

Getting started
The UltraSoundGate device appears to the PC as a standard audio recording interface. Therefore, any sound recording application can be used to operate this device. However, please note, that only certain sampling frequencies are supported (see table Sampling rates, resolutions & oversampling).

The recording software Avisoft-RECORDER USG is specifically adopted to this device and will support all UltraSoundGate features. After installation, this software can be launched from Start / Programs / Avisoft / RECORDER USG (rec_usg.exe).

First go to Options / Configuration and select the desired sampling rate from Input-Device Settings / Sampling rate. Click OK. Then click at the Pause button (Monitoring/Pause) and the Start button (Monitoring/Start). You will then see the real-time spectrogram displaying data acquired by the UltraSoundGate. For details on the operation of the RECORDER software see the Avisoft-RECORDER manual and the section Software Settings in this guide.

Components of the UltraSoundGate 416-200

4 DIGITAL INs
These 2-pole 2.5mm mini-jack connectors allow to connect external digital signals. These inputs are TTL-compatible (internal pull-up resistor of 10 kOhm to +5V). The status of the digital inputs is stored in the LSB (bit 0) of the 16-bit data words that are transmitted over the USB and can be extracted afterwards by the Avisoft-SASLab Pro sound analysis software (e.g. for creating labels). The digital input is not available in the 8-bit recording mode. Once a plug is connected to this digital input, the available resolution is reduced to 15 bits (the LSB is discarded).

4 Overload indicators
These red LEDs indicate clipping (over-modulation).

5 TRIGGER button
The silver-colored trigger button is represented to the operating system as a standard joystick button that can be used to start and stop hard-disk recording in conjunction with the Avisoft-RECORDER software. To enable this mode of operation, the trigger type Joystick button1 / USG Button must be selected from the Configuration dialog (menu Options/Configuration). If the TRIGGER button is pressed for more than two seconds, the virtual joystick button1 will be activated permanently. This is indicated by the flashing REC indicator (6). The virtual button1 can then be reset (stop recording) by pressing the TRIGGER button again (the amber LED will be switched off). This feature may be useful for recording longer sequences. If this auto-hold behavior is not desired, one of the other virtual joystick buttons may be used instead:

button1: represents the state of the button for the first 2 seconds, then auto-hold mode
button2: represents the state of the TRIGGER button (no auto-hold)
button3: represents the inverse state of the TRIGGER button (no auto-hold)
button4: changes its state each time the TRIGGER button is pressed (toggle mode)

6 REC indicator
This amber LED will flash once the device is connected to the PC. It will light again permanently as long as the TRIGGER button is being pressed (representing the state of the joystick button). If the TRIGGER button is pressed for more than 2 seconds, it will start to flash.

7 POWER indicator
This green LED will light as long as the device is connected to the USB. In case the computer or HUB is unable to provide the required supply current (because there are other devices connected or the batteries of the laptop are empty), this LED will be switched off.

8 Recording level controls
These control knobs adjust the analog input recording levels for each channel.

9 USB connector cable
Connect the UltraSoundGate 416 to a USB 1.1 or USB 2.0 port of a computer.
Available sampling rates, number of channels, resolutions & oversampling

<table>
<thead>
<tr>
<th>Sampling rates [Hz]</th>
<th>8 Bit</th>
<th>16 Bit</th>
<th>32-fold</th>
</tr>
</thead>
<tbody>
<tr>
<td>750000</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>500000</td>
<td>++</td>
<td></td>
<td>+</td>
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<tr>
<td>375000</td>
<td>+++</td>
<td></td>
<td>+</td>
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</tr>
<tr>
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<td>++++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>187500</td>
<td>++++</td>
<td>+++</td>
<td>+</td>
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<td>166666</td>
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</tr>
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</tr>
<tr>
<td>50000</td>
<td>++++</td>
<td>+++</td>
<td>+</td>
</tr>
</tbody>
</table>

This table lists the available bit depths and oversampling ratios for each sampling rate. The number of crosses represents the number of available channels at each rate. The oversampling ratio will be 16-fold for those rates not marked in the 32-fold column. 32-fold oversampling will provide slightly better signal-to-noise ratios and better anti-aliasing performance.

Specifications

Analog-to-digital converter type: sigma-delta with anti-aliasing filter

- Number of channels: 4
- ADC resolutions: 8 or 16 bit
- Number of digital inputs: 4
- Analog input impedance: 50kOhm
- Frequency response (+3dB): 0.05 ... 370 kHz
- Maximum input sensitivity: +20mV
- Supply current drawn from USB: 450 mA
- Physical dimensions (W/H/D): 103 * 56 * 145 mm
- Weight: 600 g

In the interest of product improvement, the specifications and/or appearance of this unit are subject to change without notice.

System requirements

IBM-compatible PC, Pentium II, 230MHz or more with at least one USB port, running Windows2000/XP (Windows3.1 and Windows95 are not supported and Win 98/ME do not support 3 and 4 channel recording).
End-user Agreement

This a legal agreement between Avisoft Bioacoustics and the buyer. By operating this device and the accompanying software, the buyer accepts the terms of this agreement.

1. The Device and the accompanying software is warranted to perform substantially in accordance with the operating manual for a period of six month from the date of shipment.

2. EXCEPT AS SET FORTH IN THE EXPRESS WARRANTY ABOVE, THE DEVICE IS PROVIDED WITH NO OTHER WARRANTIES, EXPRESS OR IMPLIED. THE VENDOR EXCLUDES ALL IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

3. The Vendor’s entire liability and the Buyer’s exclusive remedy shall be, at the Vendor’s SOLE DISCRETION, either (1) return of the device and refund of purchase price or (2) repair or replacement of the device.

4. THE VENDOR WILL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES HEREUNDER, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, LOSS OF USE, OR LOSS OF DATA OR INFORMATION OF ANY KIND, ARISING OUT OF THE USE OF OR INABILITY TO USE THE DEVICE IN NO EVENT SHALL THE VENDOR BE LIABLE FOR ANY AMOUNT IN EXCESS OF THE PURCHASE PRICE.

5. This agreement is the complete and exclusive agreement between the Vendor and the Buyer concerning the device.