Scan&Listen

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I. The Scan&Listen device

The particle velocity is a scalar value that was never before audible as human ears are not sensitive to it. The properties of such magnitude, the particle velocity, make it very suitable for applications where the background noise and reflections have a high level. The purpose of the setup, combined with a PU or a Scanning probe, is to easily detect and locate sound sources, even in the most complicated noise environments.

1. Setup characteristics

   a) Functionality
   Scan and Listen is a double function device that allows:
   • Listening to pressure and particle velocity:
   • Acquisition and recording of both signals

   The Microflown particle velocity sensor needs from the setup:

   b) Powering
   The Scan and Listen device provides power supply to the probe in order to make it functional and sensitive. There are two modes of powering:

   (1) Battery mode
   S&L device works with 9V batteries which allow the powering of the probe. This is allows portability of the system. The amplification of the signal is then dependent on the battery charge. The battery level is indicated by the switch color, if green, there is enough battery left to continue using the battery. If red and blinking it needs to be connected to a power socket or battery needs to be replaced with a new one.

   (2) Powered mode
   S&L can be directly connected to a power socket in order to obtain a constant current supply. This mode is mostly recommended to be used for recording and analyzing the signal in a PC in combination with a frontend.

   c) Amplification
   Differently to the Microflown signal conditioner, the S&L device is a simplified version, allowing High gain operation.
   NOTE: If Low gain amplification is needed, then a signal conditioner should be used.
d) **Equalization**

S&L device is calibrated with the probe in order to apply the best curve fitting into the setup. The system works as a simplified equalizer for the Listening function, leaving the signal intact for the signal out function (non-corrected mode).

(1) **Listening functionality**

The equalization module implemented in the S&L device is simplified compared to the Microflown signal conditioner electronics. The equalization performed enhances high frequencies applying fc2 filter.

*NOTE: The sensitivity of the sensor is constant only in Power mode, in battery mode is dependent on the battery charge*

Pressure channel is only amplified for the listening functionality.

(2) **Acquisition functionality**

If the Scan and Listen device is connected to a frontend, the pressure and velocity signal need to be corrected, applying the calibration functions as follows:

- Frequency response: Signal [Volts]/ Su or Sp, using the equations below. Obtaining the response in the selected units
- Phase response: Signal [Volts]-φu or φp
(a) Velocity sensor model correction:

\[
Sp \left[ \frac{mV}{Pa} \right] = \frac{S_u @ 250 Hz \left[ \frac{mV}{Pa} \right]}{\sqrt{1 + \frac{f_c^2 u}{f^2} \sqrt{1 + \frac{f_c^2 u}{f^2}} \sqrt{1 + \frac{f_c^2 u}{f^2} \sqrt{1 + \frac{f_c^2 u}{f^2}}}}}
\]

Or

\[
S_u \left[ \frac{V}{m/s} \right] = \frac{S_u @ 250 Hz \left[ \frac{V}{m/s} \right]}{\sqrt{1 + \frac{f_c^2 u}{f^2} \sqrt{1 + \frac{f_c^2 u}{f^2}} \sqrt{1 + \frac{f_c^2 u}{f^2} \sqrt{1 + \frac{f_c^2 u}{f^2}}}}}
\]

\[
\varphi_p [deg] = \tanh^{-1} \frac{C_{1u}}{f} + \tanh^{-1} \frac{f}{C_{2u}} + \tanh^{-1} \frac{f}{C_{3f}} \tanh^{-1} \frac{C_{4u}}{f}
\]

(b) Pressure sensor model correction:

\[
Sp \left[ \frac{mV}{Pa} \right] = Sp @ 1KHz \sqrt{1 + \frac{f_c^2 p}{f^2} \sqrt{1 + \frac{f_c^2 p}{f^2}} \sqrt{1 + \frac{f_c^2 p}{f^2} \sqrt{1 + \frac{f_c^2 p}{f^2}}}}
\]

\[
\varphi_p [deg] = \tanh^{-1} \frac{C_{1f}}{f} + \tanh^{-1} \frac{C_{2f}}{f} + \tanh^{-1} \frac{f}{C_{3f}}
\]

NOTE: More information about the calibration of probe and signal conditioner calibration contained in the probe datasheet.

B. Typical applications

- Acoustic problem detection
- Sound source location
- Fast trouble shooting
- End Of Line control
II. Compatible Probes

Number of sensors / channels:
- PU: 1 pressure sensor and 1 particle velocity sensor

Packaging:
- Regular: ½ inch, 90 mm handle. Package gain. Lemo connector.
- Mini: ½ inch, 42 mm handle. Package gain. Mini Lemo connector.
- Match: 1D - 45 mm length. No package gain. USB connector.

Maximal threshold level:
- Regular

III. Components list

- Scan and listen device
- Headphones
- Line out cable
- Probe cable
- Power supply
IV. S&L device specifications

<table>
<thead>
<tr>
<th>Physical</th>
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<tbody>
<tr>
<td>Height</td>
<td>24 mm</td>
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<tr>
<td>Width</td>
<td>79 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>130 mm</td>
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<tr>
<td>Weight</td>
<td>180 g</td>
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<table>
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<tr>
<th>General electrical features</th>
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<tbody>
<tr>
<td>Electric impedance:</td>
<td>56 Ohms</td>
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<tr>
<td>Power supply:</td>
<td>Input voltage: 15-18 V</td>
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<tr>
<td>Consumption:</td>
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<tr>
<td>max</td>
<td>1W (56.7mA at 18V)</td>
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<tr>
<td>idle</td>
<td>0.8W (44mA at 18V)</td>
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<tr>
<td>Fuse:</td>
<td>250 mA</td>
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<tr>
<td>S/N :</td>
<td>Lower than probe (included in probe datasheet)</td>
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<tr>
<td>Harmonic distortion:</td>
<td>20 dB reduction within first harmonic</td>
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<th>Environmental parameters</th>
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<tr>
<td>Variation due to temperature:</td>
<td>&lt;0,1 dB (20-55 Deg)</td>
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<tr>
<td>Variation due to humidity:</td>
<td>&lt;0,1 dB (20-90%)</td>
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<table>
<thead>
<tr>
<th>Function</th>
<th>Characteristics</th>
<th>Battery mode</th>
<th>Powered mode</th>
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<tbody>
<tr>
<td>Power</td>
<td>9v E-block battery</td>
<td>14-18 V DC power</td>
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<tr>
<td>Listening</td>
<td>Maximum output power</td>
<td>0,5 W @ 1KHz</td>
<td>1,5 W @ 1KHz</td>
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<td>Connector type</td>
<td>3,5 mm jack (to Headphones)</td>
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<tr>
<th>Acquisition</th>
<th>Maximum output power</th>
<th>Pressure</th>
<th>Velocity</th>
<th>Pressure</th>
<th>Velocity</th>
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<tr>
<td></td>
<td>330mV</td>
<td>330mV</td>
<td>700 mV</td>
<td>330mV</td>
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<tr>
<td>Connector type</td>
<td>3,5 jack (to 2 BNC)</td>
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V. Headphones: Beyerdynamic DT 770 M

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<th>Transducer Type:</th>
<th>Dynamic</th>
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<tr>
<td>Frequency response:</td>
<td>5-30.000Hz</td>
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<tr>
<td>Nominal impedance:</td>
<td>80 Ohm</td>
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<tr>
<td>Nominal SPL:</td>
<td>105 dB</td>
</tr>
<tr>
<td>Ambient noise isolation:</td>
<td>35 dBA</td>
</tr>
<tr>
<td>Total Harmonic distortion:</td>
<td>&lt; 0,2 %</td>
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VI. Cabling and Schematics

A. Schematics

1. Hardware connections

   a) Probe connection

   The PU probe is connected via the Lemo Female connector in the front part of the device. The compatible cables to make such connection are:
   - PU mini standard cable
   - PU mini S&L cable

   b) Battery mode

   To operate the system in battery mode, insert the battery block on the side of the device.
(1) **Hardware indications**

The indication of the battery status is done in the front panel, illuminating the P-U switch.
- If the battery is charged the switch will be illuminated in green when the power switch is turned on.
- If the battery is nearly empty, the switch led will start flashing and use red color.

NOTE: when using battery mode, the amplification of the signals varies with the battery charge so if acquisition functionality needs to be used, use the power mode instead of battery.

c) **Power mode**

Use this mode always for the acquisition function, to make sure the signal amplification is constant and calibrated.
To connect the power supply, subtract the battery from the battery holder, this will give access to the power supply connector.

(1) **Hardware indications**

When the power connector is used and the power switch turned on, the P-U switch with led, should be lighted.
d) Listening function

1. To use the listening functionality the headphones should be connected in the green 3,5 mm Jack connector.
2. To select the channel to which listen, pressure or velocity, use the lighted switch installed in the front side of the Scan & Listen device. The velocity channel is filtered to enhance high frequencies.
3. To select the signal amplification use the Volume switch also installed in the front panel of the device.

WARNING: The headphones cord also has a volume control, make sure it is activated in case there is no signal on the headphones and the battery indicator is green (full).

e) Acquisition function

The Scan and Listen device can also be used as a signal conditioner and connected to a frontend to acquire and/or record the pressure and velocity captured signals. To do so, the Line out connector 3,5 jack connector needs to be plugged in. The other side of the cable is finished by two BNC connections:

- Red output: particle velocity
- Black output: pressure

The pressure and particle velocity signals are not equalized so amplitude and phase need to be corrected with the equations explained in section 1.d.2. a and b.

B. Cables and connectors

Scan and Listen device is compatible with:

- Regular probe: PU mini standard cable
- Mini probe : Scan and Listen cable

The connector pinning from the Scan and Listen side is:

1. Ground
2. Pressure
3. Particle velocity
4. Plus

Figure 2. Cable connections to 4 pin Female connector in Scan and Listen device
C. **Re-calibration.**

The Scan&Listen device needs to be recalibrated with its matched probe every 2 years.

VII. **Usage and precautions**

**A. Usage and operation**

- Always review the status of the battery before using **Listen functionality**. Take into account that the amplification of the signals is battery dependent.
- If **acquisition functionality** is to be used the power supply mode needs to be used.

**B. Precautions and not to does**

Use parts, connector and power supplies provided with the equipment. Do not use the device with any cable or extension cable not supplied by Microflown Technologies. In case of losing some part please consult with Microflown Technologies before using a similar item.

VIII. **Technical contact**

For any problem or doubt with your equipment, please contact Microflown Technologies Customer service:

- Mail: cs@microflown.com
- Skype: cs.microflown
- Telephone: 0031(0) 88 001 08 11 Monday to Friday, from 9:00 to 17:00 (UTC+1).

IX. **Warranty policy, repairs and replacements**

**A. Warranty and replacement or substitution**

1. **Full warranty (year 1 and 2)**

The warranty period starts on the date of the invoice.

During the first two years (24 month) the Seller offers a warranty on all its Products, except for trading items and third party manufactured items. The Seller warrants that all Products will be free from defects in materials and workmanship for this period of two years. During this two years period, the Seller will repair or replace products free of charge. Products damaged by accident, abuse, misuse, natural disaster or by any unauthorized disassembly, repair or modification are not covered by this warranty. The incurred transportation costs of returning the Products to Seller will
be borne by the Buyer. The logistical cost for returning the Products back to the Buyer will be borne by the Seller. Several Product come with a “VOID if seal is broken” sticker, the warranty is void at all time when this sticker is broken.

2. **Grace period (year 3 and 4)**

During the third and fourth year the Seller offers a Grace Period. In the Grace Period the Products purchased at an earlier date can be replaced by completely new state of the art Products of the same scope of the original purchase. This applies only for the Products known as standard probes and signal conditioners. In the first year of the Grace Period, (year 3) customers have an option to replace their products for 25 % of the actual ex works end user price. The full freight and packaging charges apply.

In the second year of the grace period, (year4) customers have an option to replace their products for 50 % of the actual ex works end user price. The full freight and packaging charges apply.

The new products are accompanied by a new warranty. Both the two years warranty and grace period becomes applicable again from the date of invoice.

3. **Repairs outside warranty policy**

Alternatively two years after the purchase, small repairs might be offered all time against estimated costs to be quoted. Repairs come with six months’ warranty with the same condition as the two year warranty.