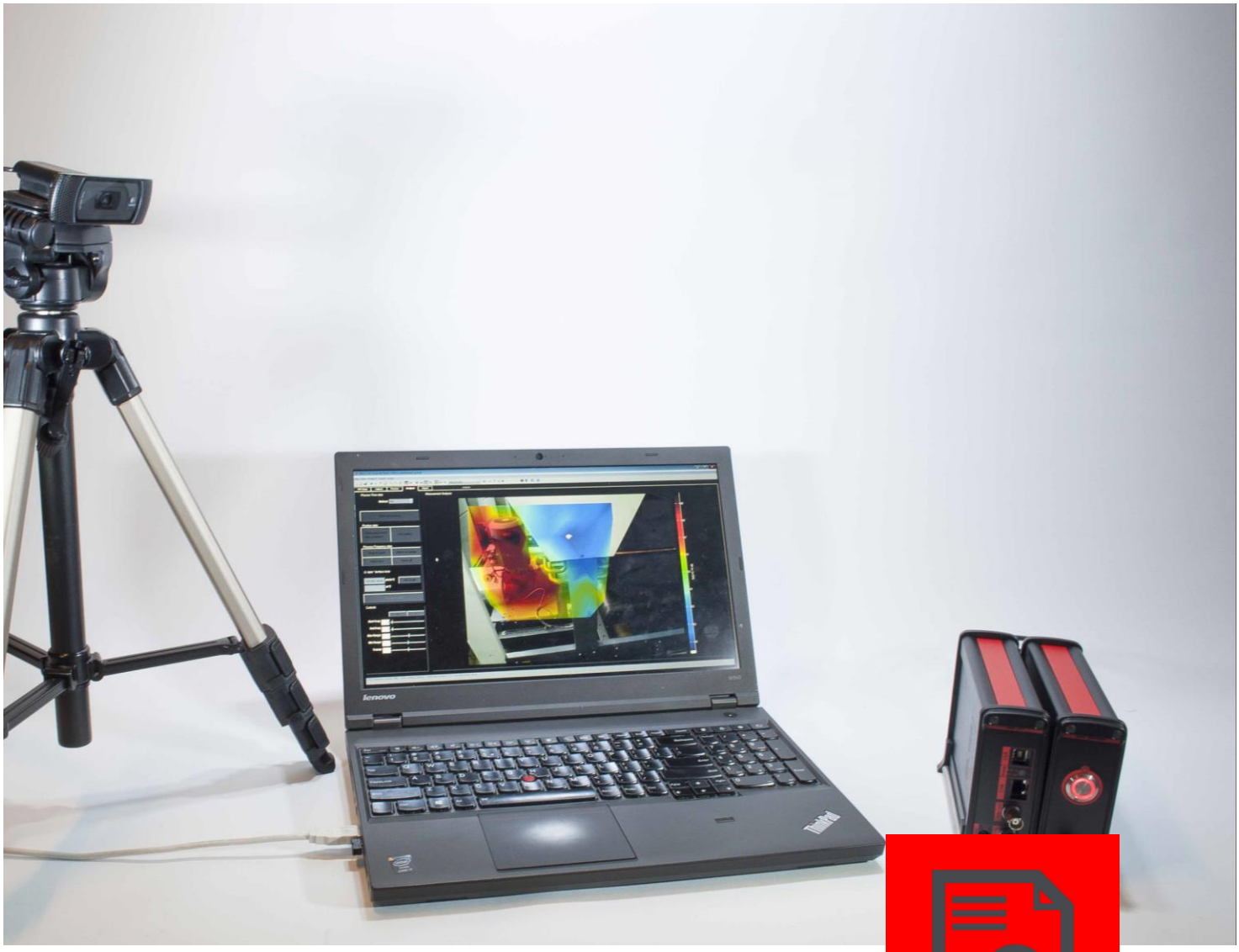
Microflown Technologies
Charting sound fields



Datasheet V2.0

Scan & Paint SETUP

SP-PA-PR/PM/PI-SCT2

SCAN & PAINT SETUP

Fast & Easy high spatial resolution sound mapping.

Stationary sound source localization and characterization.

The Scan & Paint software offers a fast and easy solution for sound source localization and characterization based on a PU probe, and a video camera. The system works under time stationary conditions.

The audio and video data are recorded and synchronized, by means of probe position tracking.

The results can be obtained by means of four analysis methods: Point method, grid method, Transmission loss method or Airborne transfer path method.

With this tool, high resolution mappings of sound pressure, particle velocity, sound intensity, sound power, transmission loss, impedance, absorption and reflection coefficients can be plotted with a very high spatial and frequency resolution.

Combining the Scan & Paint software with Scout 422 or DIC24 frontends allow the acquisition of up to two reference channels, from which relative phase information can be combined with the particle velocity information for Operational Deflection Shapes mapping.

Moreover, transfer function, coherence and phase relation of all channel combinations can be visualized for deeper data understanding.

Finally, the information obtained at any of the working steps can be combined, operated with, and extracted in several different formats, making the Scan & Paint a total and complete tool for sound source localization, characterization, troubleshooting, benchmarking as well as any other learning process in NVH development.

I. SCAN & PAINT ANALYSIS METHODS

POINT METHOD

This analysis method calculates a time window for each measured point and interpolates the data for all areas where no measurement data is available.

GRID METHOD

This calculation option sums up all measured points within one grid cell, in order to obtain a single value per cell. The time length of the data contained in each cell is generally longer than the length of the time data at one single measurement point. Thanks to longer time samples a better estimation in the lower frequency range, and a more averaged result can be obtained.

TRANSMISSION LOSS METHOD

PRESSURE METHOD

If the sound field is diffuse in the incident room the spatial average of the mean square pressure can be used to describe the energy distribution for this volume.

At the transmitted room, the intensity can be directly measured, having then enough information to calculate the TL coefficient.

INTENSITY METHOD

In the case of lack of a diffuse field on both the incident and transmitted side, the transmissibility coefficient/ In situ transparency method can be used to define the effect of insertion of the measured panel.

This method uses the intensity measured at both sides to estimate the effect of the structure insertion, assuming and being limited by the fact that at the incident side, only the normal intensity is measured (deviations with the pressure method can occur for this reason).

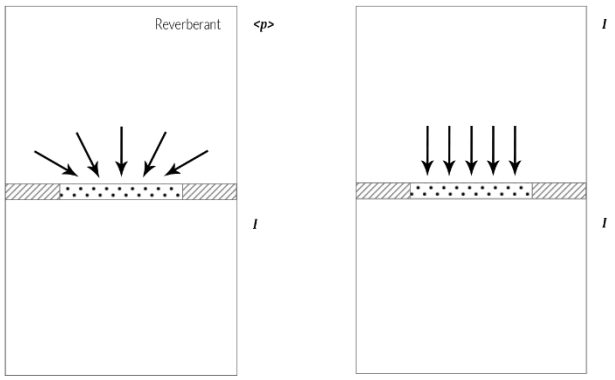


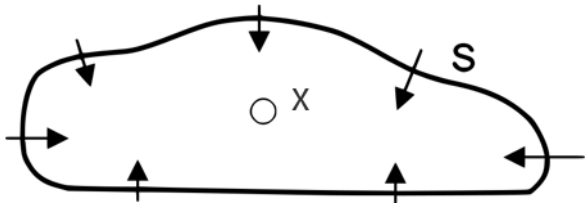
Figure 1. Pressure and Intensity TL method room requirement schematics

AIRBORNE TRANSFER PATH ANALYSIS METHOD (ATPA)

This method allows the calculation of the contribution of each surface of a cabin to the total sound pressure measured at a reference position.

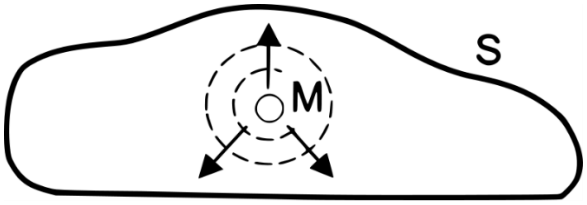
DETERMINATION OF THE RADIATION OF EACH SECTION:

Cabin is excited by the normal cabin operation



DETERMINATION OF THE TRANSFER PATH:

Cabin is excited by a known noise source positioned at the reference position



The information obtained at each measured surface for both conditions is combined to reconstruct the pressure field at the reference position:

$$|\boldsymbol{p}_{\mathbf{ref}}|^2 \approx \sum_{i=1}^{N} \left(|\boldsymbol{u}_n|^2 |\boldsymbol{H}_u|^2 + |\boldsymbol{p}|^2 |\boldsymbol{H}_p|^2 - 2\,\mathbf{Re}\{\boldsymbol{I}_n \boldsymbol{H}_I\} \right) \boldsymbol{\Delta S}_i^{\,2}$$

Where $H_u = p^{\mathrm{TF}}/Q$, $H_p = u_n^{\mathrm{TF}}/Q$, $H_I = u_n^{\mathrm{TF}}(p^{TF})^*/Q$ and I_n is the complex sound intensity measured near the surface.

II. COMPATIBLE PROBES

Probe type	Diameter	Maximum level range		Temperature range
		Pressure	Velocity	
PU regular	12.7 mm	110 dB	125 dB	-17 to 63
				
PU mini	12.7 mm	110 dB	125 dB	-17 to 63
				
PU match	8.2 mm	131 dB	130 dB	-20 to 85
				
PU match packaged	12.7 mm	110 dB	135 dB	-17 to 63
				

*SPL ref: 20 e-5 Pa

*PVL ref: 50 nm/s

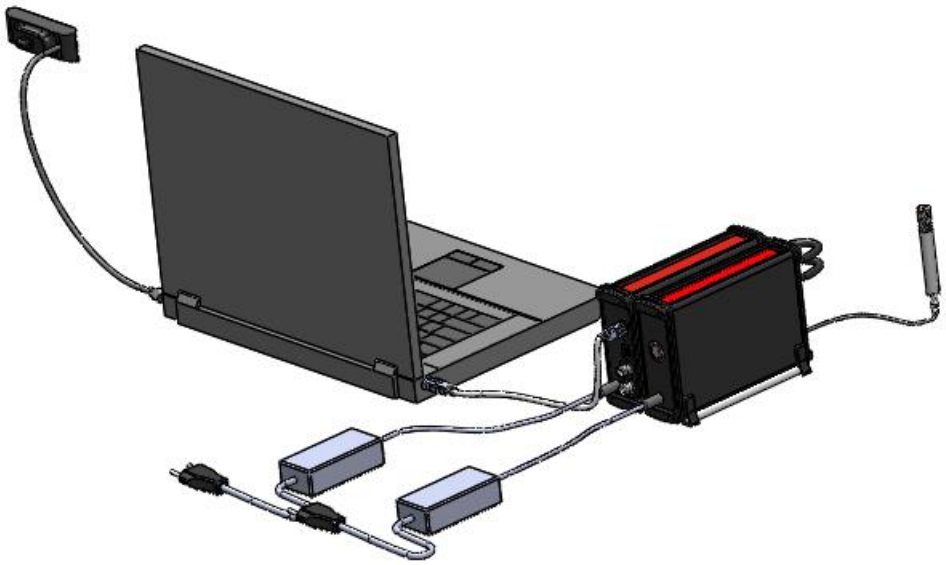
More specifications can be found on the probes datasheets.

III. COMPATIBLE FRONTENDS

Frontend	Nr. Channels		Max Fs (KHz)	Bits	IEPE
	Input	Output			
Scout422 	4 analog inputs 1 tachometer input 1 trigger input	1 amplified output 1 analog output	52	24	Yes
MFDAQ 	2analog input	1 analog output	48KHz	16 bits	No
DIC24 	24 input, expandable		350 Hz to 50 kHz	24 bits	yes

IV. CONFIGURATIONS & CONNECTIONS

Standard system configuration:



V. SYSTEM COMPONENTS

SENSOR	1x PR/PM/PT
CONDITIONER	1x MFPA-2
FRONTEND	1x Scout V2
CAMERA	Logitech B-910
ACCESSORIES	
Tripod	1x
Feet	1x (for Scout and MFPA)
CABLES	
Probe-Conditioner	1x CAB-LEMO-2.5*77
Scout-MFPA	2x BNC
Scout-PC	1x USB cable (white)
Camera-PC	integrated in camera
POWER SUPPLIES	
MFPA	1x19V
Scout	1x19V
FILES	
Calibration report	1x printed and USB (...:\Calibration*Serial.pdf)
Product manual	1x USB (...:\Software\Microflown SW)
PELICAN CASE	1x

VI. ACCESSORIES

- MICROFLOWN TECHNOLOGIES REMOTE HANDLE (MF-RH): for easy operation, the Scan & Paint setup measurement process can be managed from the remote handle, not needing the operator to go back to the pc during the data capture.
- DARK ENVIRONMENT TRACKER (ACC-S&P-TR): this accessory allows expanding the usability of the Scan & paint, making easier the color tracking in dark environments or with difficult lighting conditions.
- BATTERY PACK (ACC-BAT): New PowerGorilla battery pack is made compatible with S&P equipment in order to make it more portable.
- MICROFLOWN VOLUME VELOCITY SOURCES (HFM & LFM): for ATPA method a volume velocity usable in the frequency region of interest is required in order to have a reference of the actual radiated noise level and being able to reconstruct the decay to each cabin surface.

Please consult our sales department (info@microflown.com) for suitable accessories and add-ons for your measurement setup.

VII. F.A.Q

WHAT ARE THE FREQUENCY LIMITS FOR SOURCE LOCALIZATION?

40Hz – 10 KHz

WHAT IS THE FREQUENCY RANGE VALID TO MEASURE INTENSITY / VELOCITY / PRESSURE IN THE NEAR FIELD?

- Particle velocity:
  - 40-10.000 Hz
- Intensity:
  - 400-10.000 Hz
- Pressure:
  - 40- 10.000 Hz

WHAT IS THE FREQUENCY RESOLUTION OF THE METHOD AND WHAT DOES IT DEPEND ON?

It depends on:

- Analyzer parameters. FFT points.
- Analysis method (Grid or Point)
- Length of the time series.
    - Point method: long time series less spatial resolution. Short time series higher spatial resolution. Slow scanning, high spatial resolution.
    - Grid method: bigger grid size for better statistical performance.

Down to few Hertz

WHAT IS THE SPATIAL RESOLUTION OF THE METHOD AND WHAT DOES IT DEPEND ON?

Depends on:

- Scanning speed for point method.
- Grid size for grid method.
- Video frame rate (above 15 FPS no difference) for point method.
- Distance camera-item

Results:

Down to mm up to several cm

WHAT IS THE DISTANCE BETWEEN SURFACE AND PROBE?

- 1-5 cm for source localization (maximum SNR).
- 5-10 cm for sound intensity (reactivity error).
- The further from surface the more spatial integration.

WHAT IS THE RECOMMENDED SCANNING SPEED AND HOW DOES IT AFFECT IN THE RESULTS?

- 5-10 cm /s

WHAT ERRORS CAN OCCUR IN THE RESULT?

- Camera angle will change sound map projection
- Incorrect offset settings (rotated probe)
- Probe impact (detection and filtering tool on post-processing stage)
- Non-stationary disturbances during measurement (grid method less affected)

WHICH ANALYSIS METHOD SHOULD I CHOOSE?

- Point method:
    - Higher spatial resolution
    - Camera projection error minimized
- Grid method:
    - Better statistical averaged results.
    - More robust against non-stationary noise sources

- Faster processing

WHAT INDICATOR SHOULD BE USED FOR SOUND SOURCE LOCALIZATION?

- Particle velocity is the best indicator because velocity is less environment dependent maximizing the SNR in the vicinity of the noise source

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VIII. USAGE AND PRECAUTIONS

- Do not submerge the electronics in water as this will lead to permanent damage.
- Only use the cables supplied with the kit. Any modifications to these cables or the use of cables of a different brand or type may result in permanent damage to the probes or the rest of the electronics.
- The probes must be powered via a Microflown™ signal conditioner, the new MFPA series or the prior MFSC/ Router. Do not power the sensors with any other device; this might cause permanent damage to the system.
- Access exposure to dust/dirt particles could damage the Microflown™ sensor.

IX. TECHNICAL SUPPORT

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

- Mail: cs@microflown.com
- Skype: cs.microflown
- Telephone: +31(0) 88 001 08 11 Monday to Friday, from 9:00 to 17:00 (UTC+1).

X. WARRANTY POLICY, REPAIRS AND REPLACEMENTS

WARRANTY AND REPLACEMENT OR SUBSTITUTION

During the first two years (24 months) 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 year period, the seller will repair or replace defect 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 products come with a “VOID if seal is broken” sticker, the warranty is void at all times when this sticker is broken.

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 become applicable again from the date of invoice.

REPAIRS OUTSIDE WARRANTY POLICY

Replaced/repaired parts come with a six month warranty under the same conditions as the two year warranty.