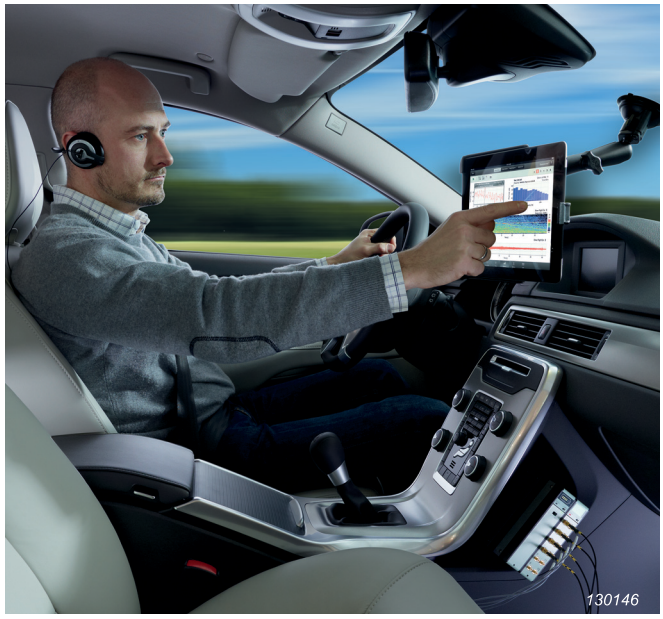
PRODUCT DATA

Sonoscout NVH Recorder BZ-5950

Sonoscout™ is an ultra-portable, multi-channel, wireless NVH recorder from Brüel & Kjær. It allows real-time recording and validation with a simple touch on your iPad® tablet screen. Sonoscout continuously displays test information, such as tacho channel output, to maximize confidence during testing, and brings simple control and analysis to tasks such as comparing vehicle and data sets.



The Sonoscout system is a combination of an iPad app (BZ-5950-A) and a battery-powered data acquisition front end based on Brüel & Kjær's modular LAN-XI hardware. Placed anywhere, it connects to up to 12 measurement transducers that transmit data to the app to record data. When used in combination with a binaural recording headset, or a head simulator, binaural recordings of cabin sounds can be captured immediately in real-time. Playback connectivity via Bluetooth® allows recordings to be audited immediately through the headset, or using the car's own audio system.

In addition, Sonoscout can be used for spectral or order analysis and filtering, which are invaluable for rotating machinery validation or benchmarking. It is also the perfect first step before exporting known data for further analysis in PULSE Reflex™, or other post-processing software.

Try out the full recording and analyzer functionality without purchasing any extra hardware, using the 'virtual front end' demonstration feature. The system runs on any iPad (iOS 7, or later) and uses one LAN-XI module with data streaming directly to the mobile device. It supports GPS and analogue CAN signals and recording to SD card is included for off-line recording and on-site data checking/analysis.

Uses and Features

Uses

- General sound and vibration measurements
- NVH characterization
- Benchmarking
- Simple troubleshooting
- Recording data for PULSE NVH Simulator models
- Binaural recordings using Binaural Recording Headphones Type 4965 or Sound Quality Head and Torso Simulator (HATS) Type 4100-D

Features

- Data recorder capable of recording up to 12 channels (iPad or SD card storage)
- 2-channel playback for listening to any vibration/sound channel
- Narrow-band and 1/3-octave band analysis (synthesized)
- Spectrogram (colour maps)
- Order slicing
- Simple sound quality metrics
- GPS tracking for speed and position
- Pre-triggering, auto-stop and time history markers
- Overlaid displays for easy comparisons
- Target curves can be created, imported and displayed
- High-pass, low-pass and parametric EQ filters can be applied simultaneously
- RPM finder (generates an RPM profile from a signal channel)
- Speed profiles can be created from a GPS recording
- TEDS support
- Automated calibration procedure
- Analogue CAN support (when used with CAN-to-Analogue Converter ZH-0700, or OBD2-to-Analogue Converter UL-1052)
- Support of various file formats:
  - Save data as BKC, WAV, PTI or HDF files
  - Export recorded data to SDF or 2-channel WAV files
  - Export results as BKC or CSV files
- Intuitive touch operation
- Free download from the App Store℠ with 'Virtual Front-end' demonstration feature
- Completely portable and battery powered
- Wireless connection to front end
- Dyn-X compatible (excl. LAN-XI Module Type 3053-B-120)

Brüel & Kjær

Fig. 1
Sonoscout NVH Recorder system

130132/3

Sonoscout NVH Recorder gives you full control of your measurements. Using an iPad tablet on the dashboard, you can see all the test information as it records for maximum confidence. Use the iPad to take pictures and videos to document measurement conditions, then mount it on the dashboard, connect it wirelessly to the LAN-XI front end*, and drive.

A typical system is shown in Fig. 1, where you can see the front end combination connected wirelessly to the iPad. All the system components and accessories are listed in the ordering information.

After the measurement, be certain you have recorded the right data by listening to the recordings either via headphones, the car's audio system, or the iPad and using multi-touch analysis such as pinching graphs to zoom in and out. FFT, synthesized 1/3-octave, order analysis and spectrogram analysis is included.

Sonoscout App BZ-5950-A is free to download from the App Store and can be installed on an unlimited number of mobile devices. To start testing using a LAN-XI module, you need Sonoscout License BZ-5950-L, which is installed in the LAN-XI module.

Fig. 2
Inside the kit

130145

Fig. 2 shows the contents of a typical Sonoscout kit (Type 3663-A-060). It includes:

- 6-ch. LAN-XI Input Module Type 3050-A-060
- LAN-XI Battery Module Type 2831-A
- Wireless LAN Frame Type 3660-A-200
- SD Card UL-1018
- Sonoscout License BZ-5950-L
- Mains Charger ZG-0469
- Car Utility Socket Cable AO-0546

The Sonoscout case contains pre-configured compartments for a host of optional accessories.

Sonoscout Kit Types 3663-A-040, 3663-A-060 and 3663-A-120 are pre-configured and ready to plug and play when you receive them.

With Type 3663-A-000 you will receive your Sonoscout license on a USB stick in a hard case.

Demo Mode

You can also run Sonoscout in 'Demo' mode, which allows you to try the functionality of the Recording task without the need for a license (or a LAN-XI connected).

Binaural Recording Headphones

Brüel & Kjær provide correction curves for the Binaural Recording Headphones, which can be used in other software, such as PULSE NVH Simulator Type 3644.

* Sonoscout supports Types 3050, 3052 and 3053 LAN-XI front ends. However, Types 3160 and 3056 have limited support in Sonoscout: only input channels are supported on Type 3160 and Type 3056 does not support high speed tacho mode or auxilliary input channels.

Recording

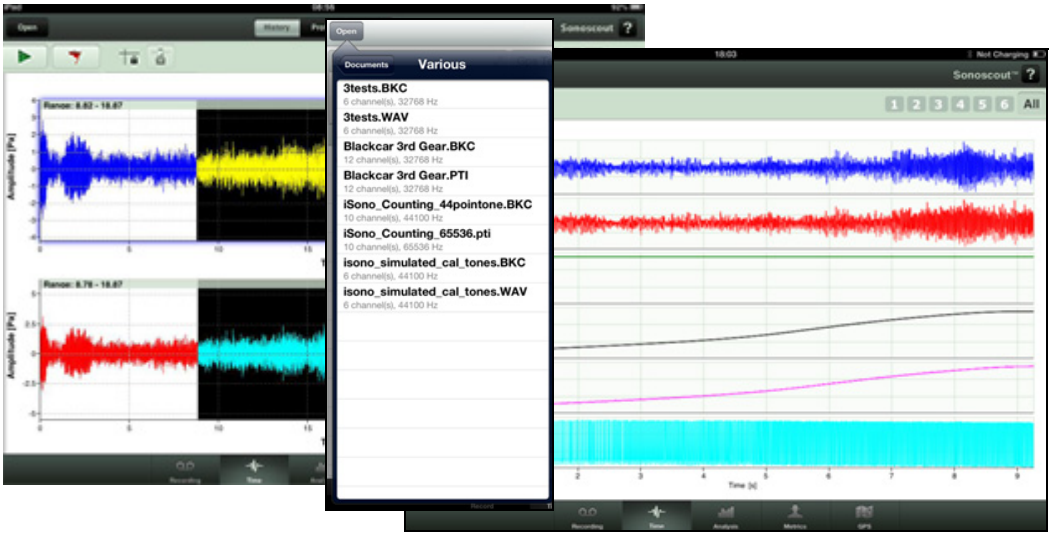
- Select and set up the front end
- Define tacho and analogue CAN channels
- Auto-calibration
- Recording (with pre-triggering and auto-stop options)
- GPS recording
- Peak and level meters
- Use markers to identify specific events or sections
- Demo Mode for trying out the entire measurement process when a front end is not available

Fig. 3
Recording – typical views

Time Data Viewing and Editing

- Display recorded time files
- Transfer LAN-XI Notar™ files from SD card
- Convert time files to different formats
- Display tacho signals as profiles
- Display analog CAN signals as profiles
- Display all channels as a strip chart
- Edit time file: trim to a range

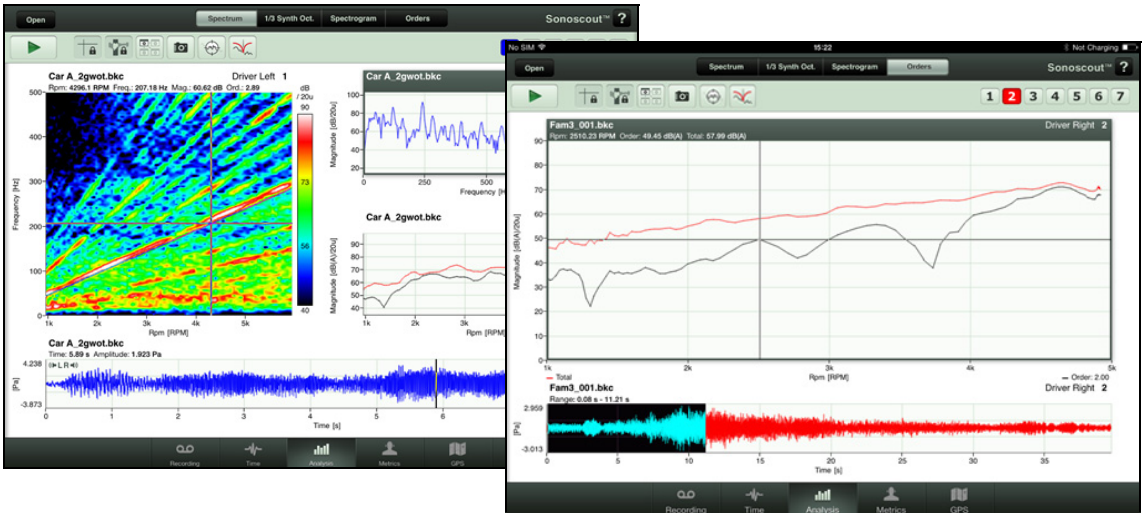
Fig. 4
Time – typical views



Analysis

- Analysis using:
  - Autospectrum or PSD
  - 1/3-octave (synthesized from FFT)
  - Spectrogram
  - Order analysis (order plus overall level)
- Average over selected range or instantaneous spectra
- View spectra while listening – real-time 2D spectrum is displayed synchronised to the play cursor
- Create, import and display target curves
- Use RPM Finder to generate an RPM profile from a single channel
- Simple filtering

Fig. 5
Analysis Task – typical views



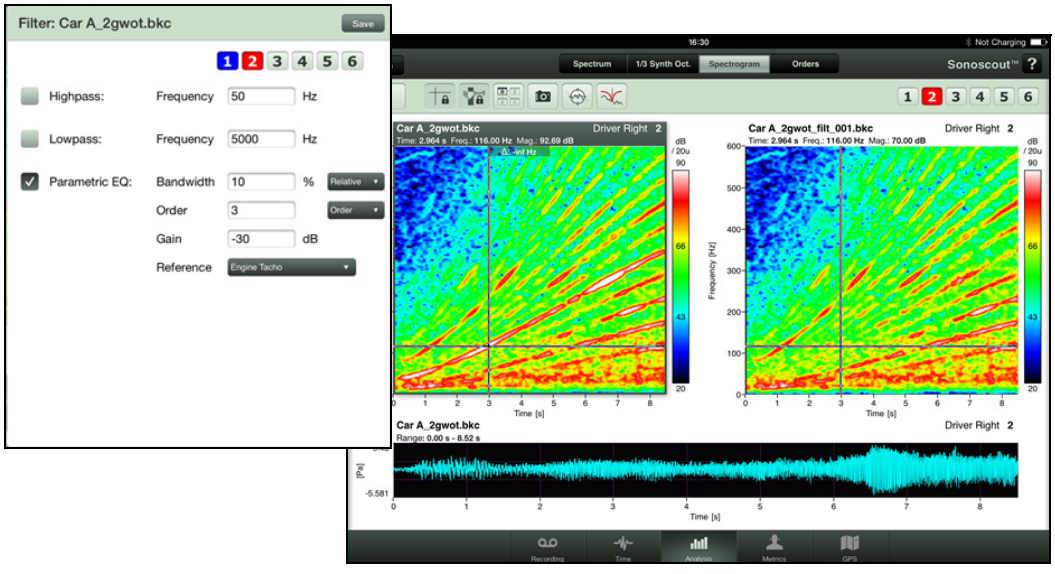
RPM Finder

This feature allows you to calculate an RPM Profile from any signal channel. You identify an order by touching it at several points in a Spectrogram and the algorithm uses this as a starting point for the RPM calculation. You can check the estimated profile using the Spectrogram before appending it to the file as an RPM profile or tacho channel (with or without GPS speed embedding).

Filtering

Apply any combination of Low-pass, High-pass and Notch (Fixed Frequency or RPM-tracked) to any channel, see the example in Fig. 6.

Fig. 6
Filtering



Here an engine order-tracked filter is applied to a 3rd engine order. A two-display layout is used to compare and listen to the filtered and unfiltered sounds – the large reduction in the 3rd order can clearly be seen.

Sound Quality Metrics

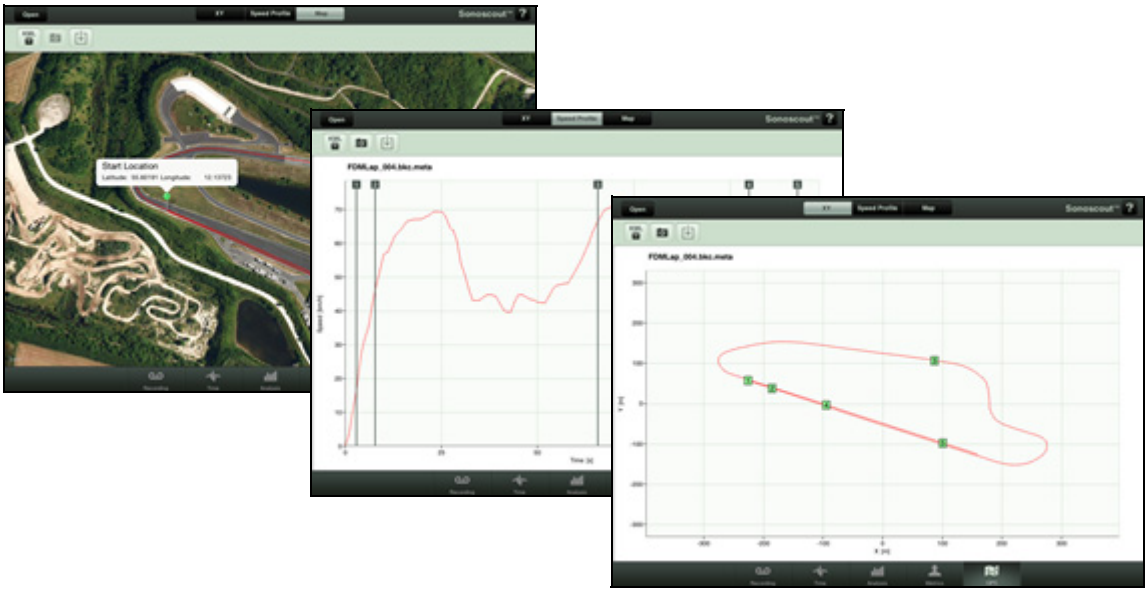
- Overall level as a function of time, RPM or speed
- Overall level in a frequency band as a function of time, RPM or speed
- Articulation Index as a function of time, RPM or speed
- Average loudness as a Critical Band Spectrum, or as a function of time, RPM or speed
- Average sharpness as a Critical Band Spectrum, or as a function of time, RPM or speed

GPS Options

This specific task has the following options:

- Display the X-Y coordinates of the currently opened file
- Display the speed profile
- Convert the GPS speed to a speed profile channel and add to the time file
- Display a hybrid map with the start and end positions marked (if you have Internet connection)
- Export file as a keyhole markup file (KML) file

Fig. 7
GPS – typical views



Note: If you have Google Earth™ installed on the PC, double-tap on the KML file and it will show you the measured route (including markers) superimposed on the satellite view.

Target Curves

Create, import and display target curves, which can then be applied in any 2-D display in the Analysis, Metrics or GPS tasks.

Display the target as a single curve, or as two curves offset by a +/- user-defined value, see Fig. 8.

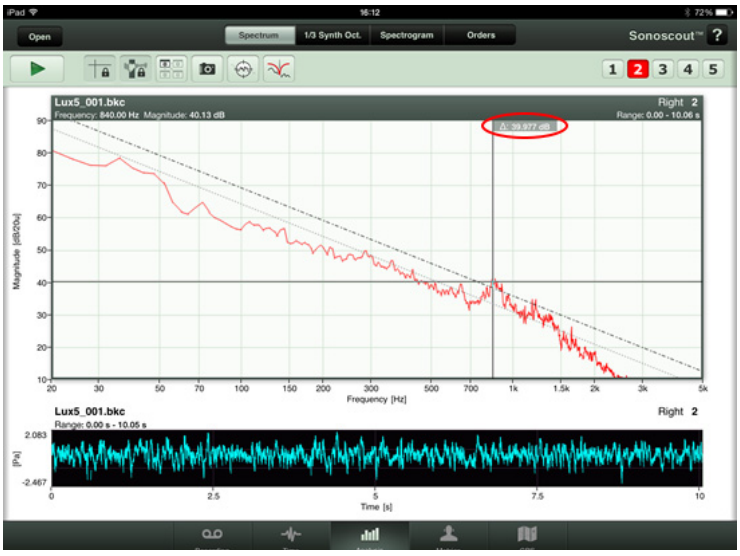


Fig. 8
Target curves can also be used as tolerance bands – the dark grey curve is set to + 2.5 dB, the light grey to –2.5 dB. The Δ cursor (highlighted) indicates the difference between the upper target and the measured spectrum

Overlaid Displays

This feature allows you to overlay up to four channels from one file, or the same channel from four different files. Each display has a different line style and a colour that matches the colour of the legend box, for easy recognition, see Fig. 9.

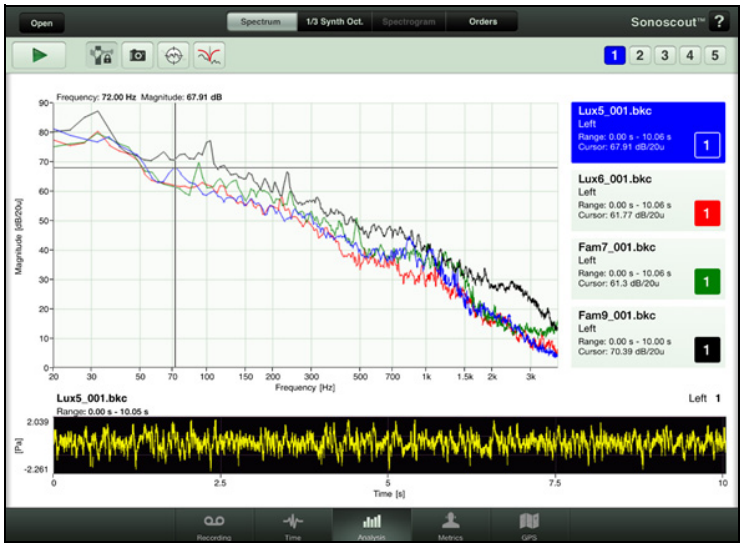


Fig. 9
Overlaid displays

The time history display is for the selected graph, and this is what you will hear if you tap the Play button.

Requirements

Apple iPad tablet running iOS 7 or later. Please see the compatibility table below for supported devices:

Device	Highest IOS Vers.	Processor	Limitations
iPad 2	iOS 8.2	1.0 GHz dual-core	None
iPad 3rd Gen	iOS 8.2	1.0 GHz dual-core	None
iPad 4th Gen	iOS 8.2	1.4 GHz dual-core	None
iPad Mini	iOS 8.2	1.0 GHz dual-core	None
iPad Mini 2 or 3	iOS 8.2	1.3 GHz dual-core	None
iPad Air	iOS 8.2	1.4 GHz dual-core	None
iPad Air 2	iOS 8.2	1.5 GHz tri-core	None

Note: In order to record GPS, the device **must** be cellular enabled.

Hardware

HARDWARE SPECIFICATIONS

The specifications, compliance with standards and service options can be found in the following Product Data:

- BP 2215: LAN-XI Data Acquisition Hardware, including module Types 2831-A, 3050, 3053, 3056, 3160 and 3660-A-200
- BP 2475: Binaural Recording Headphones Type 4965
- BP 1311: Sound Calibrator Type 4231
- BP 2101: Calibration Exciter Type 4294
- BP 1436: Sound Quality Head and Torso Simulator Type 4100/-D

For hardware/software specifications of the iPad tablet and iOS 8, please refer to the relevant product support site on http://www.apple.com/

HARDWARE DIMENSIONS

FRONT-END COMBINATION

Length: 248 mm (9.76″)
Width: 53 mm (2.09″)
Height: 131 mm (5.16″)
Weight: 2.03 kg (4.48 lb)

SONOSCOUT CASE (WITH SYSTEM COMPONENTS STORED INSIDE)

Length: 50 cm (19.69″)
Width: 42.5 cm (16.73″)
Height: 17 cm (6.69″)
Weight: 5.81 kg (12.81 lb)

Software

Free download from the App Store with 'Virtual Front end' demonstration feature

RECORDING

FREQUENCY RANGE

Maximum channel count and frequency range is dependent on the tablet and LAN-XI module. For any dual-core tablet the maximum frequency range is 102.4 kHz per channel (LAN-XI module dependent)

MODES

- Streaming to tablet: Maximum length determined by space available on tablet
- SD recording mode

REAL-TIME DISPLAYS

Channel monitor (time or FFT), channel peak level meter, channel peak level history, elapsed recording time, tachometer (time or profile), analogue CAN profile, large digital readout of an rpm, speed or CAN signal

TRIGGERING

Start: Manual (with or without pre-triggering)
Stop: Manual or auto-stop after predefined time interval

EVENT MARKER

Markers can be defined during the recording. Each marker has a unique number

CALIBRATION

Automatic: Auto-detection and calibration of all TEDS transducers on all Brüel & Kjær sound and vibration calibrators
Manual: For user-defined calibrators and non-TEDS transducers

DATA STORAGE

META-DATA

Editable user-definable information fields stored in the header of .BKC files and available for use in PULSE Reflex

NATIVE CALIBRATED FILE FORMATS

.bkc, .wav (24-bit), .hdf, .pti

TIME DATA

DISPLAYS

Display time history or profile (rpm, speed, CAN) of 1, 2, or all channels. Zoom using multi-touch or using editable settings. Range selection for replay or trimming

PLAYBACK

Select any 1 or 2 channels for listening. All sounds resampled to 44.1 kHz. Auto-crossfading during switching and at end of files to avoid clicks

FILES

Copy LAN-XI Notar files from the SD card to the tablet
Download files from the tablet to a PC using a Web browser

ANALYSIS

CALCULATIONS

FFT Lines: 400, 800, 1600, 3200, 6400, 12800, 25600
Frequency Range (Hz): 1600, 3200, 6400, 12800, 25600, 51200, 102400 (depending on LAN-XI module)
Band Types: Narrow-band, 1/3-octave (FFT)
Frequency Span (Hz): 200, 400, 800 (decimation using resampling and filtering)
Overlap %: 0, 25, 50, 66.67, 75
Averaging: Linear with Hanning window
Acoustic Weightings: Linear, A, B, C, D

DISPLAYS

Graph Types: Autospectrum (rms), PSD, 1/3-octave (FFT synthesis), spectrogram, order cut
Axes:
X-axis Scale:
- Linear
- Logarithmic
- CPB

Y-axis Scale:
- Linear
- Logarithmic
- dB

Z-axis Scale:
- Linear
- Logarithmic

Layout: 1, 2, 3 or 4 display windows. Any graph type can be displayed in each window. Different files can be displayed in different windows. Linked cursors

Cursors:

2D:

- Time
- Level

3D:

- Time
- Level
- RPM
- Speed
- Order number

Can be synchronized in different windows

METRICS

CALCULATIONS

Overall: Overall level (sound) in dB, Linear, A, B, C, D; Overall level (vibration) in dB re 1, or in units

Sound Quality: Display average values or plot as function of time, rpm or speed

- Loudness (ISO 532B), sharpness, articulation index from CPB calculation
- Display average values or plot as critical band spectra

GPS

RECORDING

GPS coordinates from mobile device's built-in to GPS unit. Update rate determined by the mobile device

DISPLAYS

X-Y plot of coordinates, Speed profile and satellite map showing starting point for the recording

Speed profile can be appended to the time history file as an additional channel

Speed display

Ordering Information

BZ-5950-L Sonoscout License

Sonoscout Kits

4-CHANNEL SONOSCOUT SYSTEM

Type 3663-A-040* 4-ch. Sonoscout LAN-XI Kit

Includes the following software and hardware:

- Type 3050-A-040: 4-ch. Input Module LAN-XI 51.2 kHz (Mic, CCLD, V)
- Type 2831-A: Battery Module for LAN-XI (incl. Mains Charger ZG-0469 and Car Utility Socket Cable AO-0546)
- Type 3660-A-200: 1-module Wireless LAN Frame (for single module wireless conection)
- BZ-5950-L: Sonoscout License
- KE-4333: Sonoscout Case
- UL-1018: 16 GB SD Card

6-CHANNEL SONOSCOUT SYSTEM

Type 3663-A-060* 6-ch. Sonoscout LAN-XI Kit

Includes the following software and hardware:

- Type 3050-A-060: 6-ch. Input Module LAN-XI 51.2 kHz (Mic, CCLD, V)
- Type 2831-A: Battery Module for LAN-XI (incl. Mains Charger ZG-0469 and Car Utility Socket Cable AO-0546)
- Type 3660-A-200: 1-module Wireless LAN Frame (for single module wireless connection)
- BZ-5950-L: Sonoscout License
- KE-4333: Sonoscout Case
- UL-1018: 16 GB SD Card

12-CHANNEL SONOSCOUT SYSTEM

Type 3663-B-120* 12-ch. Sonoscout LAN-XI Kit

Includes the following software and hardware:

- Type 3053-B-120: 12-ch. Input Module LAN-XI 25.6 kHz (CCLD, V)
- Type 2831-A: Battery Module for LAN-XI (incl. Mains Charger ZG-0469 and Car Utility Socket Cable AO-0546)
- Type 3660-A-200: 1-module Wireless LAN Frame (for single module wireless connection)
- BZ-5950-L: Sonoscout License
- KE-4333: Sonoscout Case
- UL-1018: 16 GB SD Card

BASIC SONOSCOUT SYSTEM (EXCLUDING LAN-XI MODULE)

Type 3663-000† Sonoscout LAN-XI Kit

Includes the following software and hardware:

- Type 2831-A: Battery Module for LAN-XI
- Type 3660-A-200: 1-module Wireless LAN Frame (for single module wireless connection)
- BZ-5950-L: Sonoscout License
- KE-4333: Sonoscout Case
- UL-1018: 16 GB SD Card

Accessories

UL-1029	Sonoscout Control Unit
Type 4231	Sound Calibrator
Type 4294	Calibration Exciter
KE-4333	Sonoscout Case
Type 4100-D	Sound Quality HATS
Type 3660-A-200	1-module Wireless LAN Frame
Type 4965	Binaural Recording Headset
UL-1052	2-ch. OBD2-to-Analogue Converter (Speed/RPM)
ZH-0700	4-ch. CAN to Analogue Converter

Included with ZH-0700:

- AO-0760-D-005: Cable, 4-ch. analogue output, 25-pin sub-D (M) to 4-way SMB (M), 0.5 m (1.7'), +70 °C (158 °F)
- 4 × JP-0076: Adaptor, SMB (M) to BNC (M), 50 Ω

Transducers (as required) – refer to relevant documentation

Service

Service products are covered by LAN-XI service items

RECOMMENDED THIRD-PARTY ACCESSORIES

- RAM-B-166-C-202: Suction Mount for attaching iPad to car windscreen
- RAM-HOL-AP8U: Cradle for iPad (part of above mounting bracket)

– Available from RAM® Mounts (www.rammount.com)

* For Japanese variants 'J' replaces the 'A' in the type number, for example, Type 3663-J-040.

† The Japanese variant is Type 3663-J-000.

Brüel & Kjær Sound & Vibration Measurement A/S
DK-2850 Nærum · Denmark · Telephone: +45 77 41 20 00 · Fax: +45 45 80 14 05
www.bksv.com · info@bksv.com
Local representatives and service organizations worldwide

Brüel & Kjær

2015-06

BP 2463 – 14