

Measuring Environmental Noise



Contents:

- Environmental noise measurement equipment (Demo)
- Where and how to measure environmental noise
- Sources and receptors

Environmental noise measurement equipment

• Equipment requirements for the environmental noise consultant:

- Sound Level Meter – Type 1 (some regulatory agencies will also allow a Type 2 SLM)
- Sound Level Meter should be capable of measuring the following parameters:
 - Equivalent sound level – L_{eq}
 - Fast, slow and impulse time weightings
 - Sound exposure level – L_{AE}
 - Maximum noise level – L_{max}
 - Statistical Levels – L_N
 - Day/Night sound level – L_{DN}
 - Third octaves – FFT – *desired*
 - Beneficial if vibration sensor capable for ground vibration measurements
 - Logging
 - Event trigger
 - Sound recording – *desired*
- Calibrator
- Outdoor microphone and storage system for long term monitoring
- Weather station – handheld
- Tripod
- Distance measurement equipment, i.e. tape, laser range finder, etc.



Environmental noise measurement equipment

- Accessories:
 - Handheld weather station with wind speed, temperature and humidity capabilities
 - Good sturdy tripod. Most measurements will be conducted at a height of 1.5 metres
 - Measuring tape and laser range finder for distance measurements
 - Two-way radios for measurement coordination
 - Lots of spare batteries
 - Locks and chains



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Where and how to measure environmental noise

- One of the most difficult tasks in conducting environmental noise measurements is to determine where the measurements should be made.

- Source measurements:

- Should never be conducted in the near-field
- Important to eliminate any other nearby sources
- Good practice to take multiple readings at distances double the previous
- Consideration must be given to directivity of the source and reflectivity of the surroundings
- Document everything with lots of photographs

- Receiver measurements:

- While not as useful due to extraneous sources, these are often required to meet regulations
- Usually conducted at either the receiver property line, outdoor living area or plane of an open bedroom window
- Important to get homeowner permission
- This often includes unattended monitoring
- Beware of large (noisy) dogs

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Sources and receptors

- Sources of environmental noise include:

- Industrial facilities
- Road traffic noise
- Rail traffic noise
- Aircraft noise



- Receptors are classified as places of residence and rela

- Houses, apartments, condominiums
- Hospitals
- Schools
- Cottages and resorts

- Consideration must be given to what receivers are considered for noise impact from a given source. This is usually dictated through legislation (often 300 to 500 metres from a source).

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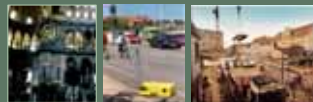
Brüel & Kjær in the Environmental Market

Brüel & Kjær products, such as sound-level meters and accompanying software, are used for assessing environmental noise and noise at work

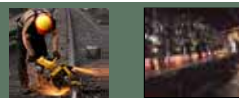
Noise monitoring in airports and large cities - hundreds of installations at public and private organisations



Noise assessment by authorities worldwide - thousands of local, regional, and national authorities



Occupational noise monitoring by authorities, insurance companies, or industrial businesses



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Range of Environmental Products



4444 & 4445



2240



2239



2236/8



2260 Inv.



2250L



2250



2270



3638



4447



4231



Evaluator



Protector



N.Explorer



Qualifier



3642



Odeon



DIRAC



PULSE REFLEX
The Product of Intuition



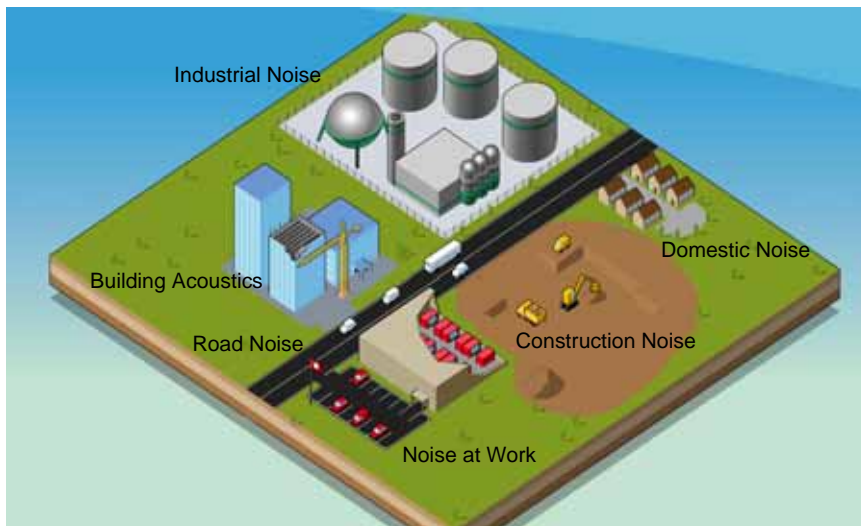
Building Acoustics

3535

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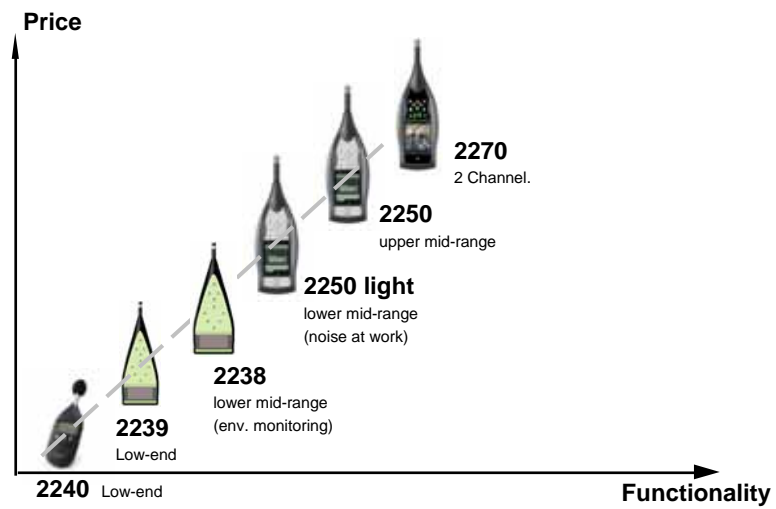
Noise Measurement / when, where, why



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Odd Noise Measurement Enquiry No 1

- I would like to measure the noise level of women grunting

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Odd Customer Enquiry No 1

- I would like to measure the noise level of women grunting



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Model 2240

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Construction Noise

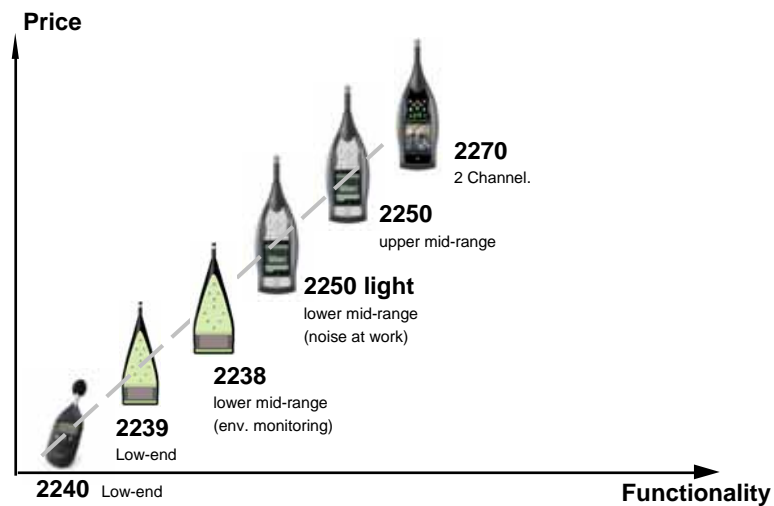
- Perimeter Noise Level < 67dB
- Monitoring Period, 18 Months
- Weather protected
- 1 hour averages with max level
- Battery power



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SLM & Analyser portfolio



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2250 & 2270 - toolbox of applications



- BZ 7222 *Sound Level Meter Application*
- BZ 7223 *Frequency Analysis Application, CPB*
- **BZ 7224 *Logging Application***
- **BZ 7226 *Signal Recording Application***
- BZ 7225 *Enhanced Logging Application*
- BZ 7227 *Reverberation Time Module*
- BZ 7230 *FFT Analysis Application*
- BZ 7231 *Tone Assessment*
- BZ 7228 *Building Acoustics*

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Construction Noise

- Perimeter Noise Level < 67dB
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Type 3535 – features

- 7Kg weight specification (fully populated)
- Mains or battery power as standard
- IP 44 water resistant specification
- Accommodates Digi router or Wavecom modem
- 2 low mass, high capacity Li.lon battery packs
- 4 days continuous battery power
 - Battery power management with 2250 timers
 - For example for 9am to 5pm monitoring yields 12 days of power or 14 days if Saturdays and Sundays excluded.
 - Timers to be included in 2250 L setup from June 2009

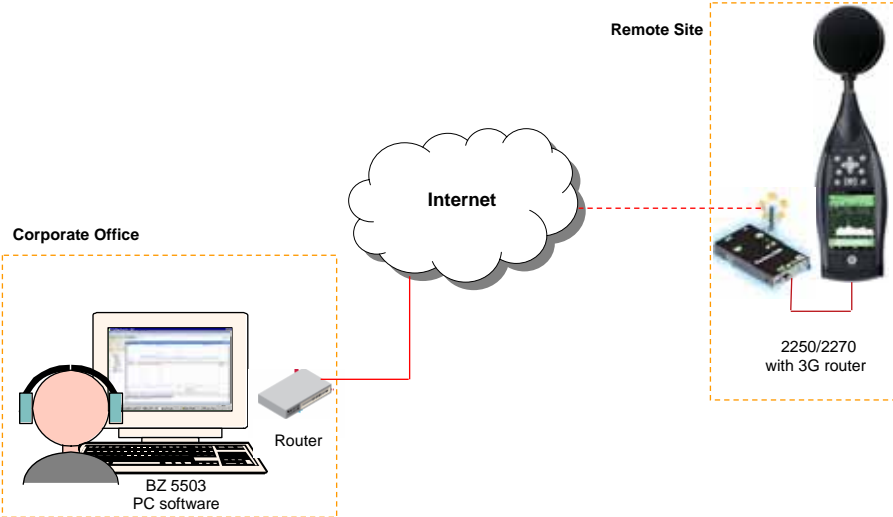


Type 3535 All Weather Case supplied as standard with two batteries, two chargers, power panel and all internal wiring

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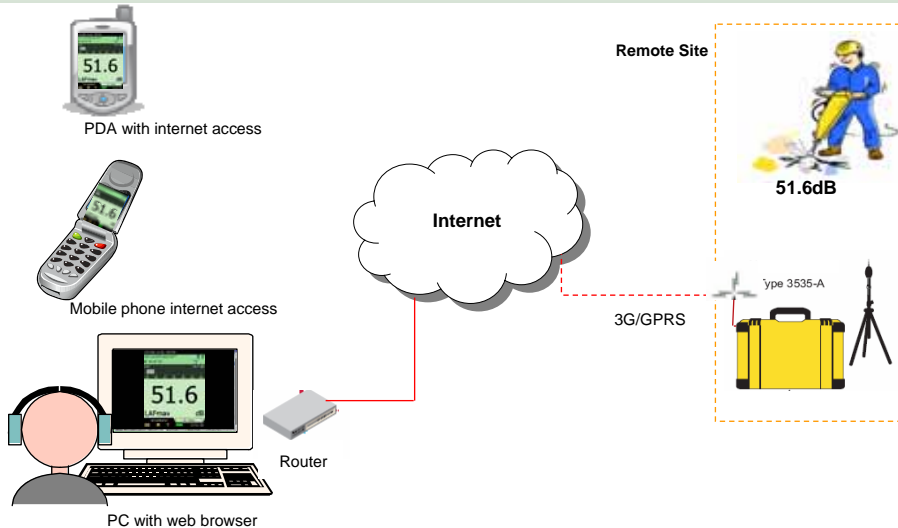
Broadband communication with 2250/2270



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Web browser access to Type 3535 system



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The Connectivity Perspective

“A USB or Ethernet cable the length and breadth of the globe....”



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Odd Noise Measurement Enquiry No 2

- How to determine political popularity using acoustics

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Odd Customer Enquiry No 2

- How to determine political popularity using acoustics



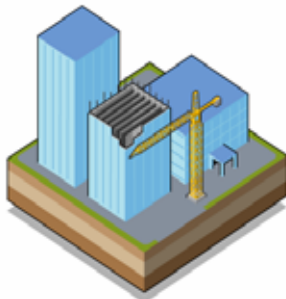
Model 2250 Light

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Building Acoustics

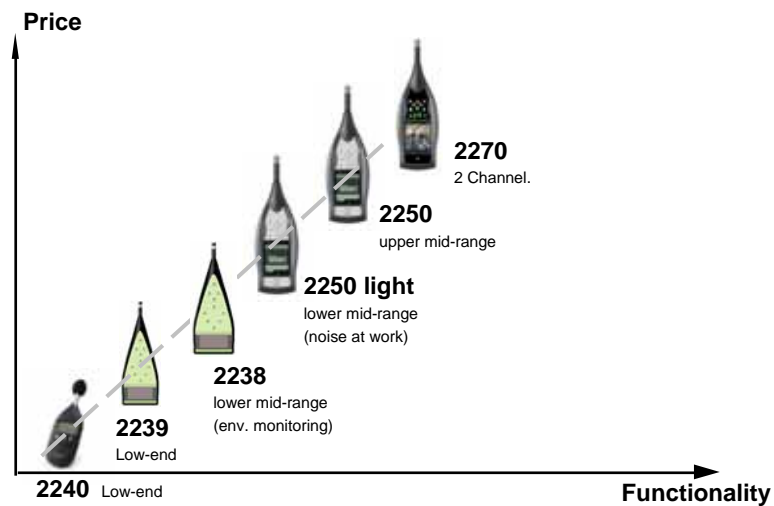
- Sound Insulation must be $>53\text{dB}$
- Easy to Use
- Portable and Rugged



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2250 & 2270 - toolbox of applications



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- BZ 7225 *Enhanced Logging Application*
- BZ 7227 *Reverberation Time Module*
- BZ 7230 *FFT Analysis Application*
- BZ 7231 *Tone Assessment*
- **BZ 7228 Building Acoustics**
- **BZ 7229 Dual Channel Building Acoustics**

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SLM Technology – has it advanced that much?



- Sound Level Measurement
- Averaging
- Image Capture
- Level against Time display
- Statistical Analysis
- Signal Generation
- Calibrator

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SLM Technology – has it advanced that much?



- Sound Level Measurement
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Domestic Noise

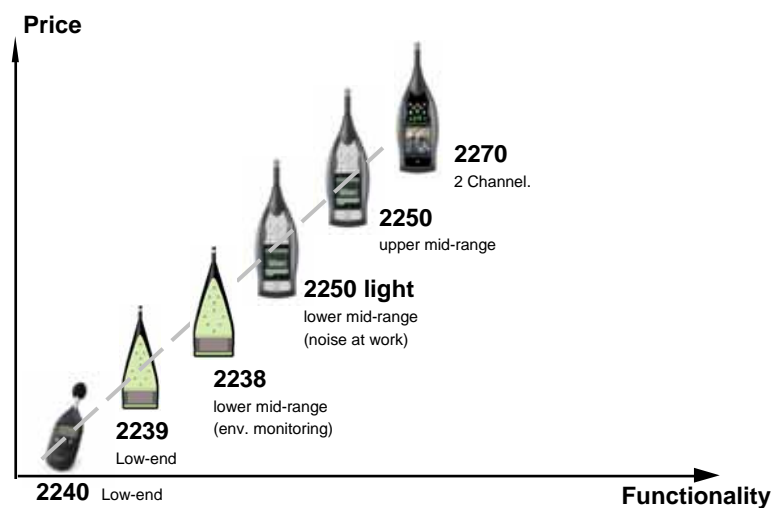
- Neighbour Noise at unsociable hours
- Unpredictable occurrence
- Residents very frustrated



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MATRON - Neighbour Noise Nuisance Recorder



MATRON system
using 2250

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Domestic Noise

- Neighbour Noise at unsociable hours
- Unpredictable occurrence
- Residents very frustrated



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Odd Noise Measurement Enquiry No 4

- Who can sing the highest note at the BBC Fame Academy

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Odd Customer Enquiry No 4

- Who can sing the highest note at the BBC Fame Academy



Model 2260

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Odd Noise Measurement Enquiry No 5

- Consumer test – is the new Toyota iQ quieter than a bicycle

Summary – Tips for The Environmental Engineer

- Check that your instrumentation is in good working order, use a wind screen
- Check the battery levels of the sound level meter and calibrator
- Make sure to calibrate your instrument at the beginning and end of the measurement session
- Check the applicable standards for appropriate measurement equipment and techniques
- Select the correct time constant i.e. fast, slow or impulsive
- Make sure to measure all of the appropriate noise metrics e.g. Leq
- Check the background noise level
- Pay attention to the weather conditions and record them
- Mount the sound level meter on a tripod or hold at arms length
- Check that you are in the far field and confirm your sound level meter settings
- Repeat measurements when possible and at varying distances
- Keep away from reflecting surfaces during measurement
- Make note of acoustic characteristics of the source e.g. tonality, steady noise, intermittent etc.
- Make a sketch of the area, record all distances and take lots of photographs for your report



