Technical Documentation

Hand-held Analyzer Type 2250

With 2250 Sound Level Meter Software BZ 7222,
2250 Frequency Analysis Software BZ 7223 and
2250 Logging Software BZ 7224 and
2250 Sound Recording Option BZ 7226

User Manual

Brüel & Kjær

English BE 1713 – 15

Hand-held Analyzer Type 2250

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2250 Frequency Analysis Software BZ 7223,
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User Manual

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Safety Considerations

This apparatus has been designed and tested in accordance with IEC 61010 – 1 and EN 61010 – 1 *Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use*. This manual contains information and warnings which must be followed to ensure safe operation and to retain the apparatus in safe condition. Special note should be made of the following:

Safety Symbols

The apparatus will be marked with this symbol when it is important that you refer to the associated warning statements given in the manual.

Protective Earth Terminal Hazardous Voltage

Explosion Hazard

The equipment is not designed to be used in potentially explosive environments. It should not be operated in the presence of flammable liquids or gases.

Warnings

- Switch off all power to equipment before connecting or disconnecting their digital interface. Failure to do so could damage the equipment.
- Whenever it is likely that the correct function or operating safety of the apparatus has been impaired, it must be made inoperative and be secured against unintended operation.
- Any adjustment, maintenance and repair of the open apparatus under voltage must be avoided as far as possible and, if unavoidable, must be carried out only by trained service personnel.

- Do not dispose of electronic equipment as unsorted municipal waste
- It is your responsibility to contribute to a clean and healthy environment by using the appropriate local return and collection systems
- Hazardous substances in electronic equipment may have detrimental effects on the environment and human health
- The symbol shown to the left indicates that separate collection systems must be used for any discarded equipment marked with that symbol

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Chapter 1

Introduction

Welcome

This user manual describes the Type 2250 Hand-held Analyzer platform, including 2250 Sound Level Meter Software BZ 7222, 2250 Frequency Analysis Software BZ 7223, 2250 Logging Software BZ 7224 and 2250 Sound Recording Software BZ 7226.

The manual explains how to perform a basic sound measurement, which parameters you can measure and how the instrument should be operated. In addition, some practical hints and guidelines are provided, including all relevant technical specifications. Finally, a glossary is added to help with specific terminology found in this manual.

How to Use this Manual

Conventions Used in this Manual

Instructions and descriptions that refer to Type 2250 pushbuttons are shown with the pushbutton icons as seen on the instrument. See Chapter 2 for a list of pushbutton icons and their functions.

Menu items and buttons/tabs used on the screen

Indicated by bold type face (for example, select **Calibration** from the list of options).

Parameter Text Appearing on the Screen

Parameters, instructions and descriptions appearing on the screen are indicated by italics (for example, *Measurement Mode*).

Path Denotations

Indicated by capitals (for example, SETUP\BZ7222\).

Beginners

Before you read the rest of this manual, read Brüel & Kjær's primer on Measuring Sound. This will give you a basic idea of acoustic measurements. It can be found on the www.bksv.com website, by typing 'Primer' in the search window. The website also contains lots of other information you might find useful.

Further information is available in the On-line Help installed on Type 2250.

Experienced Users of Acoustic Measurement Equipment

The manual is designed so that you don't have to read all of it to be able to use the instrument. It is built around the most frequently used operations, these are as follows:

- Assembling your Type 2250 (see Chapter 2)
- Making your First Measurement (see Chapter 3)
- Getting to Know Your Type 2250 (see Chapter 4)
- Calibration (see Chapter 5)
- Data Management (see Chapter 6)
- Transferring Data to Your PC, Post-processing and Reporting (see Chapter 7)
- Advanced Use of Type 2250 – Tips and Tricks (see Chapter 8)

However, it is recommended that you read the entire manual for appropriate procedures on how to use Type 2250 to obtain accurate sound level measurement results.

Chapter 2

Assembling your Type 2250

Introduction

This chapter describes how to assemble and set up your Type 2250 system. It provides brief description and an associated diagram showing the instrument components and the various input and output connections. This enables you to start getting familiar with the instrument, while assembling your system.

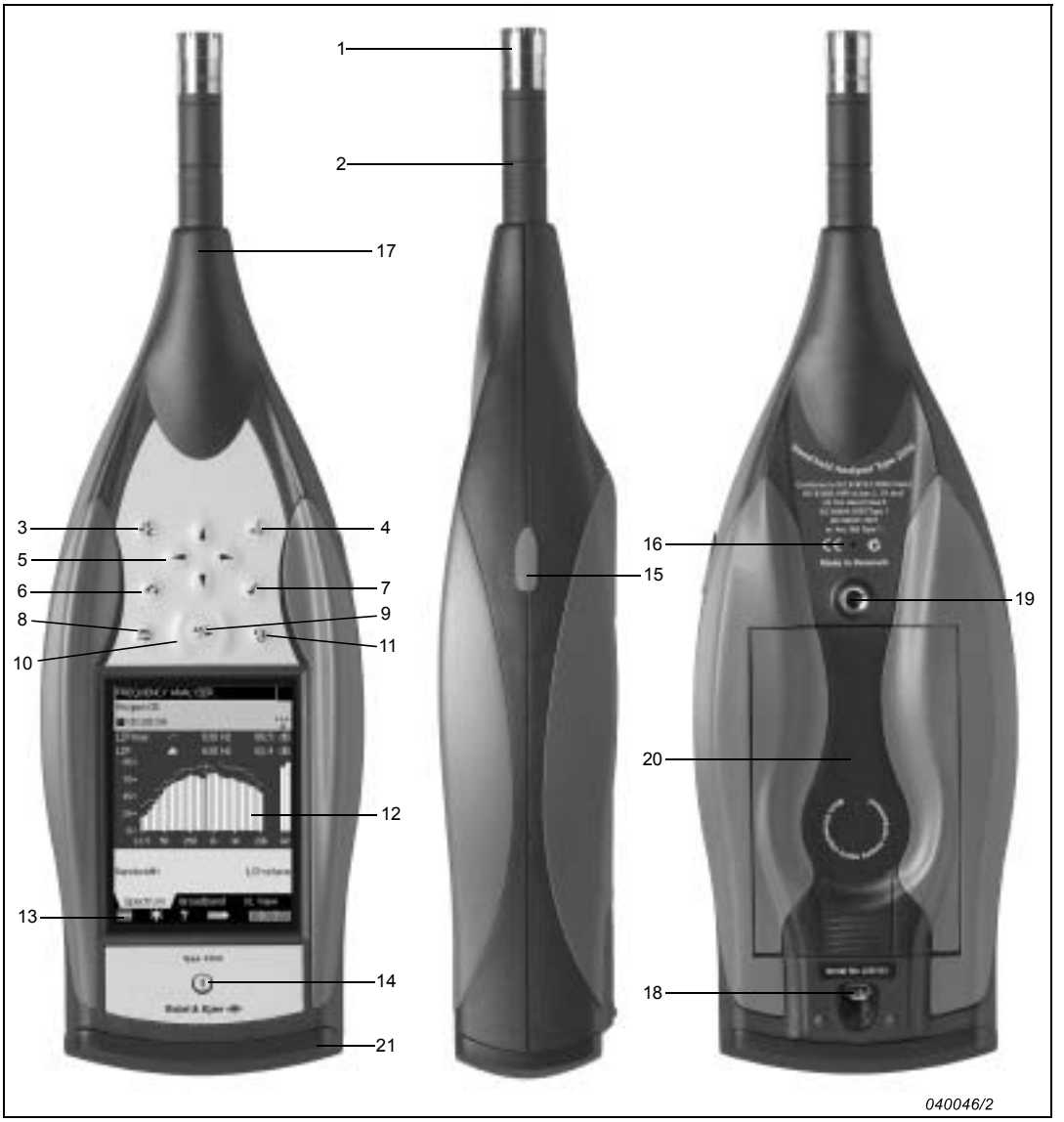
This is followed by an overview of the hardware components, showing all the main configurations of the instrument and its accessories.

Finally, instructions are provided that explain how to assemble standard and optional hardware components used in your system. Once you have followed the assembly instructions, your Hand-held Analyzer will be ready to make measurements.

Instrument Components

An overview of the main instrument components is provided in Fig.2.1. The descriptions that follow refer to those components.

Fig. 2.1 *Instrument components*



1) **Measurement Microphone:** A Brüel & Kjær Prepolarized Free-field ½″ Microphone is used. A robust and reliable microphone with a wide frequency range.

2) **Preamplifier:** Used to convert the high-impedance output of the microphone to low impedance, suitable for driving long extension cables.

3) ⊛ **(Manual Event Pushbutton):** This allows you to manually indicate events during a measurement. Using BZ 7222 and BZ 7223 software you can control sound recording (this requires a license for the BZ 7226 option), and using BZ 7224 Logging Software you can

insert an Event Marker and control sound recording (the latter requires a license for the BZ 7226 option).

4) **(Commentary Pushbutton):** This allows you to add recorded audio messages to your measurement files.

5) , , , **(Navigation Pushbuttons):** These move the active screen component (Field Selector) and navigate the user interface.

6) **(Back-erase Pushbutton):** This allows you to erase the last 5 seconds of measurement data or to insert an Exclude Marker (BZ 7224 Logging Software only).

7) **(Accept Pushbutton):** This allows you to accept any changes you make to the instrument's setup.

8) **(Reset Measurement Pushbutton):** This allows you clear the current measurement from the screen, rather like the 'C' or cancel button on a calculator.

9) **(Start/Pause Pushbutton):** Press this to start, pause or continue with a measurement.

10) **(Status Indicator):** The red, yellow or green lights, (or LEDs), referred to as the 'Traffic Light' either side of the **Start/Pause** pushbutton, indicate important states of the instrument during operation, i.e., measurement stopped, paused or running. See Chapter 4 for further details

11) **(Save Pushbutton):** This allows you to save measurement results.

12) **Display Screen:** A high-contrast, colour, touch-sensitive screen.

13) **(Main Menu icon):** This calls up the Main Menu, which allows you to navigate immediately to all the main functions of the instrument, such as **Setup**, **Explorer** (or Databrowser), **Preferences**, and the **Calibration** procedure.

14) **(Power-on Pushbutton):** Turns the instrument on and off. If held in for 1 second, the instrument goes into standby mode; if held in for more than 4 seconds, it turns the instrument off.

15) **Stylus:** Stored in a holder on the side of the instrument, for use on the touch-sensitive screen. You can choose to use the stylus or the hardkeys, depending on your preference and the measurement situation. (Also see "Use of Stylus and Navigation Pushbuttons" in Chapter 4.)

16) **Secondary Microphone:** This is used to add recorded comments to measurements and is positioned on the underside of the instrument.

17) **Top Socket:** This is the main microphone input socket for Type 2250. The Measurement Microphone and Preamplifier (items 1 and 2 resp.) are normally connected directly to this socket. For more details see Description of Inputs/Outputs that follows.

18) **Tripod Mounting Thread:** Use this to mount Type 2250 onto the tripod and/or tripod extension.

19) **Wrist Strap/Tripod Mounting Thread:** Use this to attach the wrist strap to Type 2250 for added security, or use it to mount Type 2250 onto the tripod and/or tripod extension using the tripod adaptor UA 1673.

20) **Internal Battery Pack:** Rechargeable, high-capacity Li-Ion battery pack to power the Type 2250.

21) **Hinged Cover:** A removable plastic cover is provided, which is hinged at the top to provide protection for the connector panel underneath. To remove, simply open the cover and pull the hinge out of the slot at the top of the connector panel. The cover includes a rubber insert printed with an overview of the main connectors and reset button for easy recognition. Six indents are provided on the inside of the cover (behind the insert) which allow you to drill holes in the plastic cover, giving access to the main connectors underneath, so you can fit the cover while power is connected, for example.

Description of Inputs/Outputs

Top Socket

This 10-pin LEMO connector is the main microphone input for Type 2250 (see item 17 in Fig. 2.1). Microphone Type 4189 (including Preamplifier ZC 0032) is normally connected directly to this connector. If required, however, one of two microphone extension cables (AO 0441-D-030, 3 m and AO 0441-D-100, 10 m), can be fitted between the input stage and the main microphone input socket, to extend the distance to the desired length.

USB Interface

The USB Interface (see item 1 in Fig. 2.2) provides high-speed direct communication with a PC's USB port. It is used to synchronise measurement and setup data with a host PC. Use the supplied cable, AO 1476.

The USB Interface is also used for connection to a printer. (See "Printer Settings" on page 57.) Use cable AO 0657 for connection to a printer that supports PCL language.

Earphone

The 3.5 mm minijack earphone socket (see item 2 in Fig. 2.2) enables the instrument to be connected to a set of headphones/earphones, for reviewing recorded comments or for monitoring the measured sound. Use the supplied earphones, HT 0015.

Output

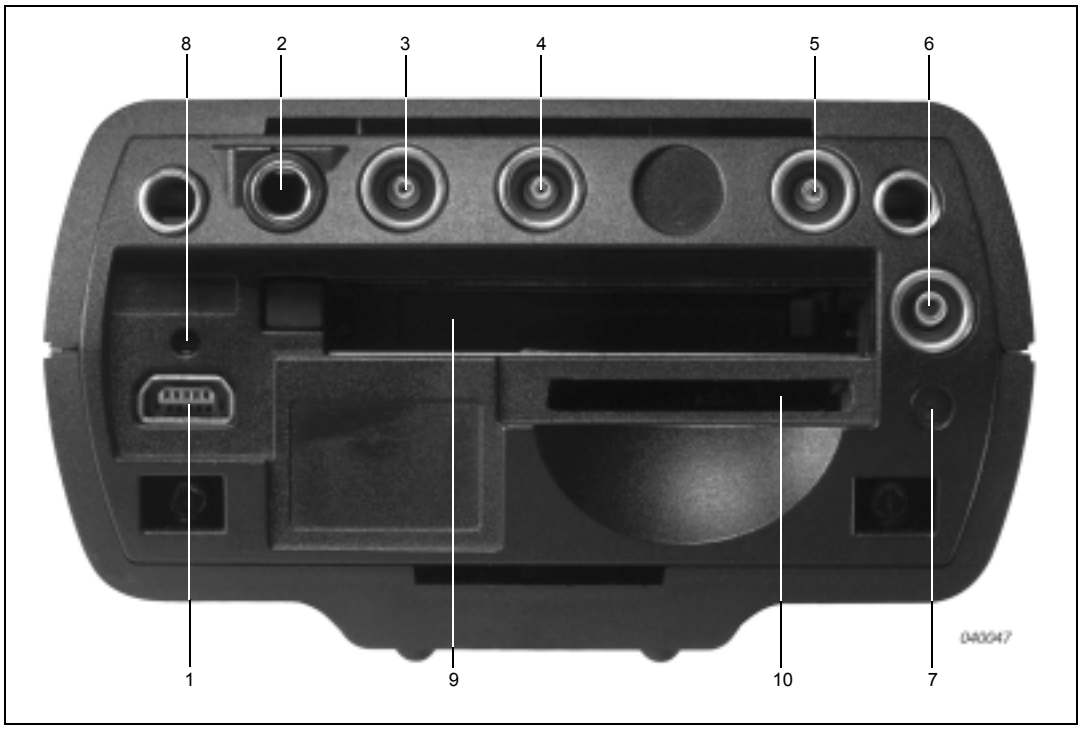
This triaxial LEMO connector (see item 3 in Fig. 2.2) is used to output the conditioned input signal, for monitoring purposes. Use cable AO 0440-D-015 (LEMO to BNC).

Trigger Input

This triaxial LEMO connector (see item 4 in Fig. 2.2) is used for the external trigger input, or start/stop signals to the instrument. Using BZ 7222, BZ 7223 and BZ 7226 software you can

control sound recording (this requires a license for the BZ 7226 option). If you want to start and stop the recording using an external device, connect it to this input. See details in Appendix A.

Fig. 2.2 *Connector panel of Type 2250*



Input

This triaxial LEMO connector (see item 5 in Fig. 2.2) is used for AC or CCLD inputs to the instrument. It can be used when analysing electrical signals, from (for example) transducers or sound recordings. Use cable AO 0440-D-015 (LEMO to BNC).

Note: This connector is referred to as the **Rear Socket**, also in the software.

External Power

⚠ **CAUTION:** Use specified battery charger only.
Charging below 0°C (32°F) is not recommended. **Note:** If you charge the battery pack below 0°C, the lifetime of the batteries will be reduced.
Do not charge battery pack in temperatures above 60°C.
Do not dissassemble or expose battery pack to fire or water.

Type 2250 is powered by an internal rechargeable battery pack. An indication of available charge is shown by the battery icon  at the bottom of the screen. If the charge remaining is low or empty, the batteries can be recharged by connecting Mains Power Supply (Part No. ZG 0426) to the 'Ext. Power' socket (see item 6 in Fig. 2.2). When the power supply lead is connected, the  icon will be displayed in place of the battery icon.

Battery Charge Indicator

A battery charge light, (LED), indicates when the battery pack is being charged from external power, (see item 7 in Fig.2.2). It shows a steady green light when external power is applied (and the battery is charging), and a flashing green light when charging has finished.

Reset Button

Located above the USB connector (see item 8 in Fig.2.2), it is used to reset the Type 2250 if you have problems with the instrument and cannot get it to operate. To reset, press the button with the point of the stylus – see chapter 9 for troubleshooting.

Slot for Compact Flash (CF) Cards

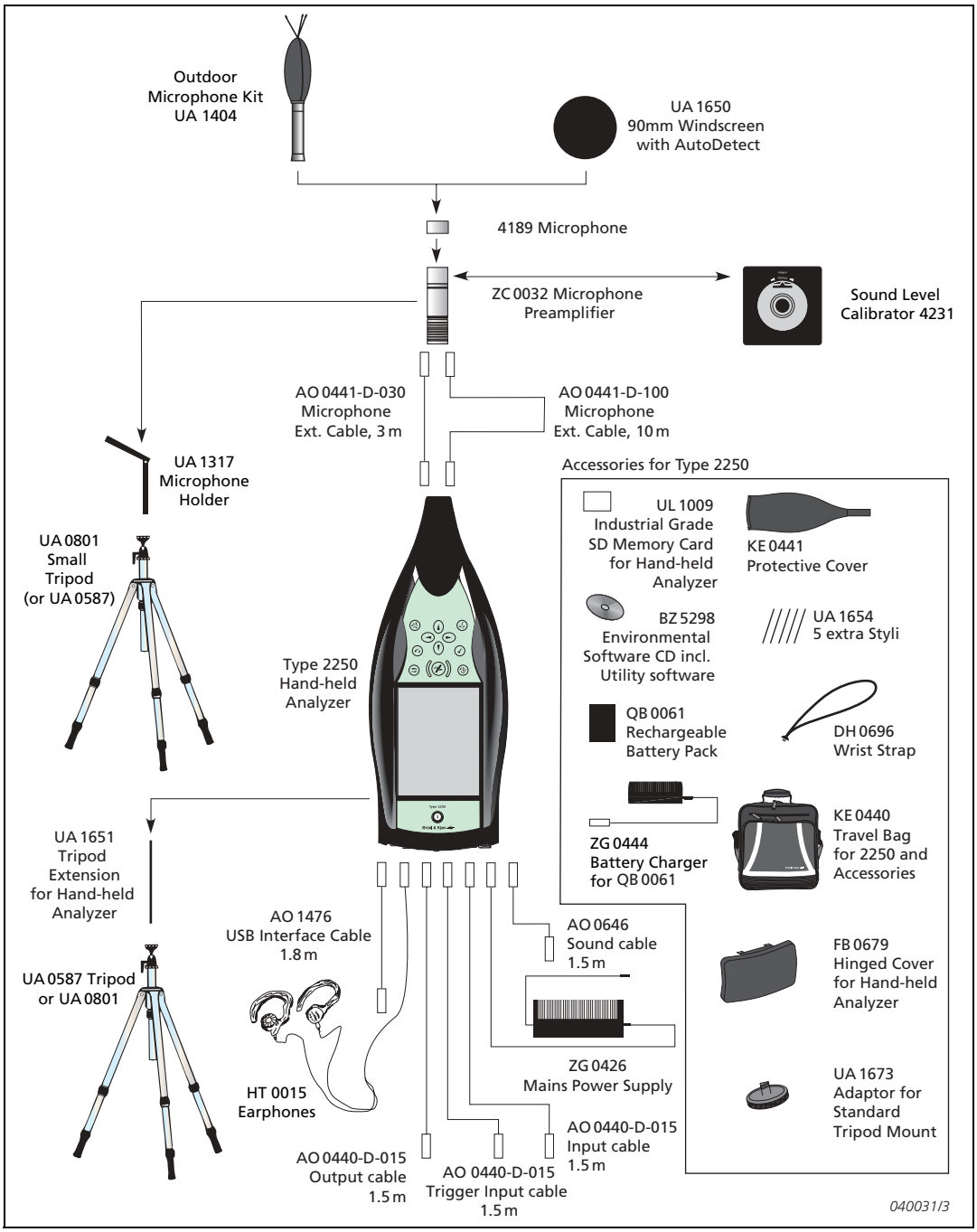
This slot (see item 9 in Fig.2.2) accepts CF sized cards and can be used for memory or, for example, a modem.

Slot for Secure Digital (SD) Cards

This slot (see item 10 in Fig.2.2) accepts SD memory cards and is typically used to save measurement data. Capacities in excess of 1 gigabyte are acceptable.

Hardware Setup

Fig. 2.3 *Type 2250 – hardware overview*



Assembling Type 2250

Charging the Battery for the First Time

Battery Pack QB 0061 comes charged to approximately half capacity on initial delivery. Before assembling your Type 2250 for the first time, it is recommended that you fully charge the battery pack, by connecting Mains Power Supply ZG 0426 to the external power socket, (see item 6 in Fig. 2.2). It should take approximately 8 – 10 hours.

The battery charge light, (see item 7 in Fig. 2.2), shows a steady green light when external power is applied (and the battery is charging), and a flashing green light when charging has finished. You can leave Type 2250 with external power on, even when the battery is fully charged. Also see "Battery Pack and Recalibration of Battery Charge Indicator" on page 63.

Making Good Measurements

The fact that you are using your Type 2250, which fully complies with the IEC 61672–1 standard, ensures you always make good measurements. Type 2250 should be set up using the following recommended assembly instructions. This is to minimise the influence of acoustical reflections during measurements. All the components described below are shown in Fig. 2.1 and Fig. 2.3.

Another set of instructions are provided in the "Alternative Measurement Method (Extended Microphone)" on page 11, for situations where users need to position the microphone at a distance from the Type 2250, while still complying with the standard.

Placing the Measurement Microphone

The measurement microphone must be placed away from shielding, reflecting, or absorbing objects. In a diffuse sound field, absorbing objects will reduce the measured sound levels. In a free sound field, reflecting objects can change the measured sound levels. Typically, the sound level 0.5 m from a plane reflecting wall is 3 dB higher than if there was no wall.

The operator of the system may be personally shielding, absorbing, and reflecting, and can be an additional noise source. Measure downwind in dry conditions with a windspeed less than 5 m/s.

The optimum position for the microphone is best found by trying different positions and observing the resulting sound levels.

Mounting the Measurement Microphone

Before mounting the measurement microphone, note the following precautions:

- When screwing on the microphone, **do it gently** to avoid damaging threads
- Keep dust and foreign matter off the microphone diaphragm. **Do not touch** the diaphragm with anything – it is very delicate

Note: Once the measurement microphone and preamplifier have been assembled and connected to your Type 2250, they should normally be left connected to the instrument.

To connect

1) Gently screw Microphone Type 4189 onto Preamplifier ZC 0032, see items 1 and 2 in Fig. 2.1.

2) Insert the male plug of the preamplifier into the top socket of the Hand-held Analyzer (see item 17 in Fig. 2.1) and push gently until it snaps into position.

To Disconnect

1) To remove the preamplifier and microphone, grip the locking collar firmly and slide back, to remove the preamplifier and microphone combination from the Type 2250.

Mounting the Windscreen

For short outdoor noise measurements (or indoor measurements exposed to air movement) mount Windscreen UA 1650 onto the microphone and preamplifier combination, making sure it 'snaps' into place over the windscreen sensor. The sensor is built into the preamplifier, see item 2 in Fig. 2.1. Icons in the status field on the screen indicate whether the windscreen is detected or not. For longer-term outdoor measurements, see Mounting the Outdoor Microphone Kit below.

Mounting Type 2250 onto the Tripod Extension Stem and Tripod

Mount Type 2250 onto the Tripod Extension Stem UA 1651 and Small Tripod UA 0801, as follows:

1) Screw Tripod Extension Stem UA 1651 onto the threaded stud of the ball-joint on Small Tripod UA 0801. Secure the ball-joint in a roughly vertical position (i.e., in-line with the tripod) until ready to follow instructions in step 4).

2) Screw the Extension Stem UA 1651 into the Type 2250, using the threaded socket situated on the underside of Type 2250, at the back, (see item 18 in Fig. 2.1).

3) Set Small Tripod UA 0801 (including Type 2250) in the required position, and adjust it to the required height. Ensure that one of the three legs is pointing in roughly the same direction as your Type 2250 needs to point. (We will refer to this leg as the front leg.)

4) Position the extension stem at an angle of 45° to the horizontal and vertically in-line with the front leg of the tripod – this is to ensure the whole setup is stable.

Note: The procedure is the same if Tripod UA 0587 is used instead of Small Tripod UA 0801.

Once you have carried out these instructions, you are ready to start measuring, see Chapter 3.

Alternative Measurement Method (Extended Microphone)

The measurement microphone can be placed a distance from Type 2250 by connecting an extension cable and fitting the microphone to a microphone holder or to Outdoor Kit UA 1404. Type 2250 should be set up using the following assembly instructions. This is to ensure that the accessories have limited acoustical influence on the instrument during measurement. All the components described below are shown in Fig. 2.1 and Fig. 2.3.

Mounting the Outdoor Microphone Kit

For longer-term outdoor measurements, an Outdoor Microphone Kit UA 1404 will be required as an alternative to the windscreen. If this is the case, mount the kit onto the microphone and preamplifier combination according to assembly and mounting instructions in the User Manual for the Outdoor Microphone Kit, BE 1077.

Connecting a Microphone Extension Cable

There are two optionally available extension cables which are recommended for use with Type 2250. These are:

- AO 0441-D-030 – 3 m long
- AO 0441-D-100 – 10 m long

Note: Connecting a recommended microphone extension cable has no acoustical effect on the Hand-held Analyzer's measurement and has no effect on the instrument's calibration. However, although it is not essential to re-calibrate, it is good measurement practice to calibrate the whole measurement chain (including microphone extension cable) before starting a measurement.

Decide which cable you require and assemble as follows:

1) Gently screw Microphone Type 4189 onto Preamplifier ZC 0032, see items 1 and 2 in Fig. 2.1.

2) Insert the preamplifier into the female plug of the extension cable and push gently until it snaps into position.

3) Insert the male plug of the extension cable into the top socket of the Hand-held Analyzer (see item 17 in Fig. 2.1) and push gently until it snaps into position.

Mounting the Measurement Microphone on the Microphone Holder and Tripod

Mount the microphone and preamplifier combination onto Microphone Holder UA 1317 and Small Tripod UA 0801, as follows:

1) Set Small Tripod UA 0801 in the required position, and adjust to the required height.

2) Screw Microphone Holder UA 1317 onto the threaded stud on the tripod ball-joint, and position the holder as required.

3) Push the microphone and preamplifier combination carefully into the microphone holder, so that it grips onto the body of the microphone and preamplifier. Ensure that the microphone lead sits properly in the plastic guide.

Once you have carried out these instructions, you are ready to start measuring, see Chapter 3.

Measuring for Convenience

Measurements that need to be done at short notice, with no particular accuracy can be carried out by simply holding the instrument or using any combination of hardware components and accessories shown in Fig. 2.3.

Chapter 3

Making your First Measurement

Introduction

This chapter describes how to make a basic measurement and how to save and document the results. It assumes you have just received your Hand-held Analyzer Type 2250 and are turning it on for the first time. If the instrument has been used before, and the previous user has initiated the multi-user facility, then the screens that are displayed may not follow the sequence described below. If this is the case, please refer to the "Multi-user Facility" on page 56.

Note: A stylus is stored in a holder on the side of the instrument, see item 15 in Fig. 2.1. This can be used on the touch-sensitive screen to select icons and functions during the procedures that follow. Alternatively, you can use the various pushbuttons, see items 3 to 11 in Fig. 2.1.

The following procedures assume that the measurement microphone and preamplifier have been mounted as described in Chapter 2 and Type 2250 has a fully charged battery, see "Charging the Battery for the First Time" on page 10.

"Point and Shoot"

Using the following basic procedure you will be able to start using your hand-held analyzer immediately to make measurements and start the familiarisation process:

1) Switch on by pressing ⏻ and make sure the **SOUND LEVEL METER** Project Template is selected.

2) Check that the data path at the top of the screen displays the correct job/project, (i.e., where you want to save the new data).

3) Set *Measurement Mode* to manual and change any setup parameters by tapping the Main Menu icon ☰ and selecting **Setup** from the drop-down that appears.

4) Press the **Start/Pause** pushbutton, then monitor the status indicator (traffic light).

5) Use the **Start/Pause**, **Continue**, **Back-erase** and **Reset** pushbuttons to control the measurement.

6) When measurement has finished, press the **Save** pushbutton to save your data.

7) Add any spoken comments to the measurements by pressing the **Commentary** pushbutton and add any written comments by tapping the Main Menu icon and selecting **New Note** from the drop-down that appears.

8) To view and organise your data, tap the Main Menu icon and select **Explorer**.

Note: You are not required to set any measurement ranges on Type 2250, the instrument has a dynamic range of more than 120 dB, from 140 dB down to the noise floor of the microphone, (if the microphone has nominal sensitivity).

Congratulations!

You should now be familiar with the basic principles of the Type 2250. If you need more help, the following section goes into the measurement process in more detail. If not, please refer to "Getting to Know Your Type 2250" on page 23.

Making a Measurement

What is a Project Template?

A Project Template contains all the common display settings and measurement setups required to perform a noise measurement. The template does not contain any measurement data – this data is saved as individual projects, stored in job folders, see "Description of Jobs and Projects" on page 43. The Project Templates covered by this manual, are:

- Sound Level Meter Project Template (included in BZ 7222 software)
- Frequency Analysis Project Template (included in BZ 7223 software)
- Logging Project Template (included in BZ 7224 software)

Note: The Sound Recording Option BZ 7226 does not contain a specific template – the sound recording options are available in all templates included in BZ 7222/23/24.

If you make any changes to the settings in a Project Template, an '∗' will appear next to the template name to indicate that the new settings have not been saved. Select **Save Template** from the Main Menu to save the settings in the current template.

Switching On

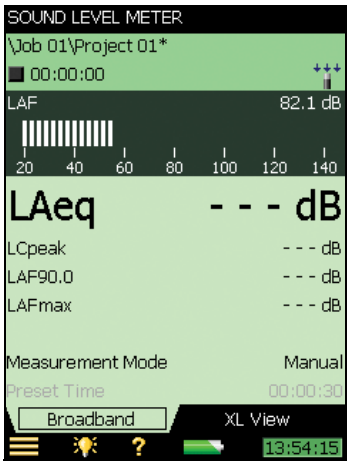
Switch Type 2250 on by pressing . The start-up time depends on the state the instrument was in when last switched off and it may take up to 1 minute from a cold start, or up to 5 seconds if the instrument is already in Standby Mode, (i.e., from a warm start).

Note: A cold start is described as a re-boot of the instrument from ROM. This normally occurs after the instrument has been turned off for some time, either by the user or following an automatic power-down. A warm start takes the instrument quickly from Standby Mode to Operating Mode without having to re-boot. (The battery needs to be charged for this to happen, see "Charging the Battery for the First Time" on page 10.)

Set the Sound Level Meter Project Template

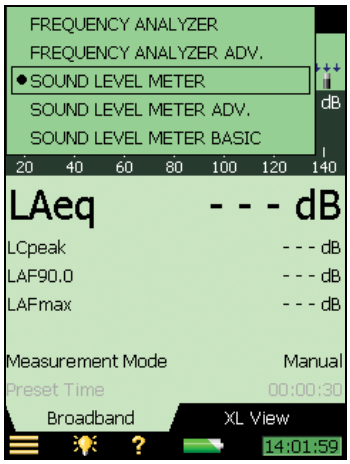
After initialisation, the screen shown in Fig. 3.1 appears:

Fig. 3.1
Initial sound level meter screen



1) Check that the **SOUND LEVEL METER** Project Template is displayed at the top of the screen, see Fig. 3.1. If not, use the stylus to tap on the bar at the top of the screen to reveal a drop-down list and select **SOUND LEVEL METER** from the list, see Fig. 3.2.

Fig. 3.2
Changing the project template



2) Tap on *Measurement Mode* in the view area and set to *Manual*, see Fig. 3.3.

Note: The bar-graph showing the sound pressure level L_{AF} is now live, but parameters such as L_{Aeq} are not. This is because L_{AF} is an instantaneous value, always available for display, whereas L_{Aeq} is a measured value that needs to be averaged over a period of time. Therefore, it cannot be displayed before you have started a measurement using the **Start/ Pause** pushbutton ⏯.

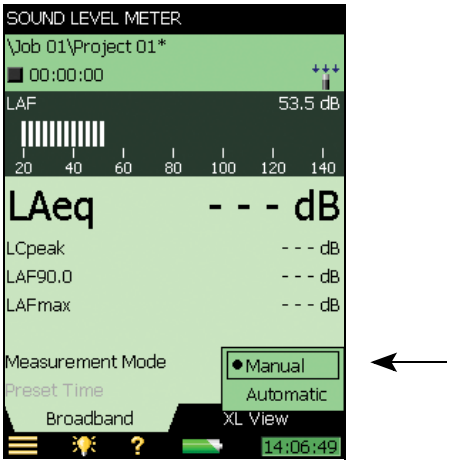


Fig. 3.3
Setting the measurement mode

3) Press the **Start/Pause** pushbutton to start the measurement.

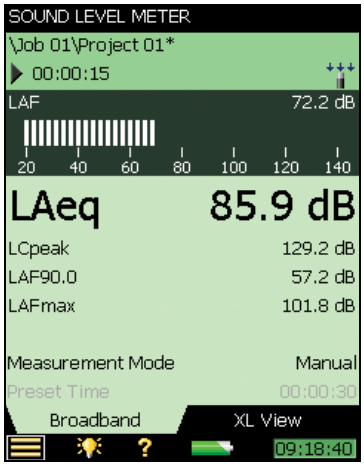
   Note: *Start* appears on the screen as feedback when you press the **Start/Pause** pushbutton.

   Notice the Start Icon ▶ on the screen and monitor the red, yellow, green 'traffic light' status indicators around the **Start/Pause** pushbutton while you are measuring. The indications should be as follows:

   - yellow status indicator flashing every 5 s before you start the measurement
   - steady green status indicator after you have pressed the **Start/Pause** pushbutton and during the measurement (if everything is OK)
   - yellow status indicator flashing every 5 s when you have stopped, saved the measurement and are ready to do another measurement
   - yellow status indicator flashing slowly, 0.5 s on, 0.5 s off, if you pause the measurement
   - red status indicator flashing rapidly if you encounter an overload condition during the measurement

4) Use the **Start/Pause**, **Continue**, **Back-erase** and **Reset** pushbuttons to control the measurement. The status field at the top of the screen will give short textual feedback on the pushbutton operation. A visual indication of measurement status is also displayed on the status line, by way of the *Stopped* icon ■, the *Running* icon ▶ and the *Pause* icon ❙❙. See Fig. 3.4.

Fig. 3.4
Measurement feedback in the status field



5) Toggle between different display parameters, as required, by tapping on each parameter field (for example LAF90.0 in Fig. 3.4) with the stylus and selecting other parameters from the drop-down lists that appear.

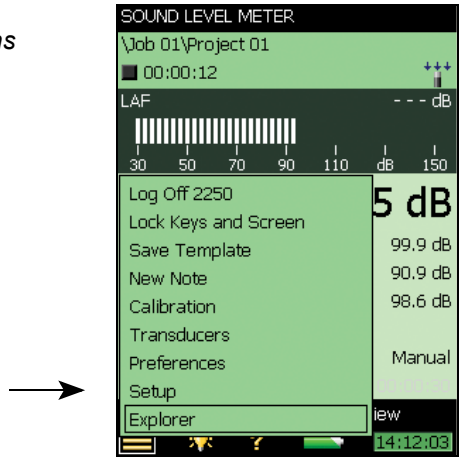
   Note: The tabs at the bottom of the screen allow you to choose different ways of displaying the measurement results.

   - The *Broadband* view shows an instantaneous L_{AF} readout, with associated bar graph and four measurement parameters, followed by two measurement setup parameters. (The first parameter is displayed in a larger font size for better readability, see Fig. 3.4)
   - The *XL View* increases the size of the first parameter readout to a 4 digit, full-screen display (including decimal point)

6) Set *Measurement Mode* to *Automatic* and choose a pre-set time for your measurement. Then repeat steps 3 and 4. The measurement will automatically pause after the pre-set time. This allows you to either save your measurement or continue measuring, as required.

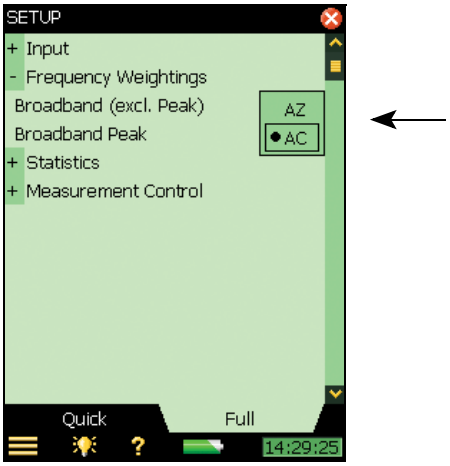
7) Tap the Main Menu icon and select **Setup** from the list of options, see Fig. 3.5.

Fig. 3.5
Main Menu options



Change the broadband weighting parameters by tapping on the 'plus' icon + next to *Frequency Weightings*, then on the weighting parameter field on the right-hand side of the screen. A weighting drop-down menu will appear, see Fig. 3.6. Change the parameters as required.

Fig. 3.6
Changing the broadband frequency weightings



8) Return to the bar-graph screen of the **SOUND LEVEL METER** template, by tapping and you are ready to make a new measurement.

Save your Measurement

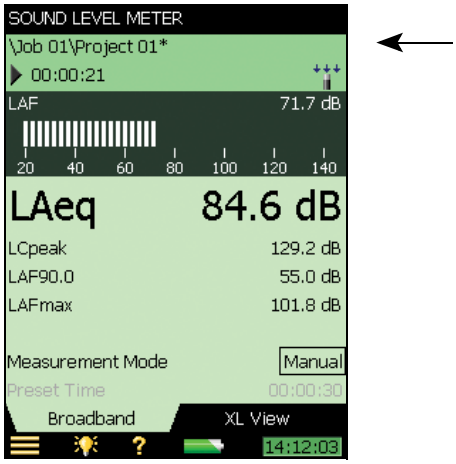
When you have completed your measurement, you need to save it. By default Type 2250 creates a job folder called *JOB 01*. Job folders represent the upper level of the data (or file) management system, with individual measurements or sets of data, represented by projects

appearing under the relevant job. By default Type 2250 also creates a project called *Project 01* under *JOB 01*. (Subsequent measurements will be labelled *Project 02*, *Project 03*, etc., under *JOB 01*. This will happen each time you have saved a measurement.*)*

Check that the data path at the top of the screen displays *\JOB 01\Project 01** and save your measurement by pressing the **Save** pushbutton. For more details refer to "Organising Measurements" on page 43.

Note: An asterisk will appear alongside the project at the top of the status field as soon as you start your measurement, see Fig.3.7. This signifies that the measurement has not been saved. It will disappear once you have saved the measurement.

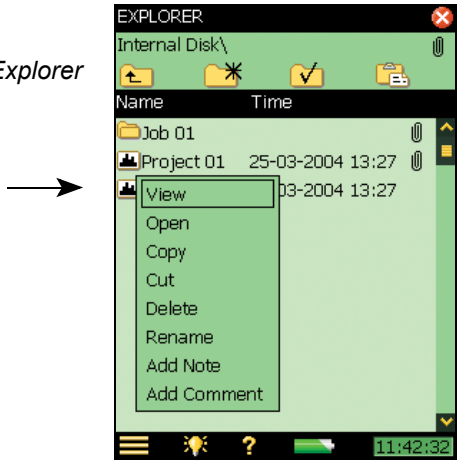
Fig.3.7
Saving your measurement



Viewing the Saved Measurement

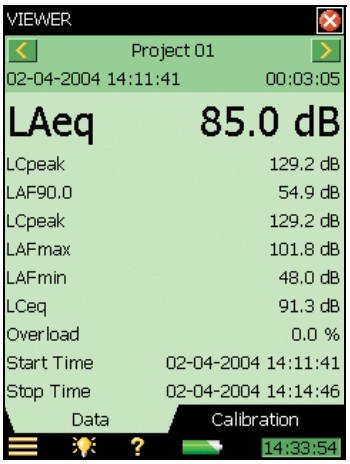
1) To view the saved measurement, tap the Main Menu icon and select **Explorer** from the list of options. Tap on the name of your measurement (*Project 01* in this case) and select *View* from the drop-down that appears, see Fig.3.8. (Or just tap on the measurement icon to the left of the name.)

Fig. 3.8
Viewing your measurement in Explorer



2) This opens the Data Viewer, see example in Fig. 3.9. The viewer displays the data in a pre-defined format, where you can select and view different parameters, as necessary.

Fig. 3.9
The Data Viewer



3) When finished, tap ⊗ to return to Explorer and ⊗ to return to the measurement screen.

Document your Measurement

One method for documenting your measurement is by attaching a short spoken comment to the project you are working on. This is done before, during[a] or after saving the measurement by pressing and holding down the **Commentary** pushbutton, while talking to the instrument.

a. For Logging Software BZ 7224, annotations are added directly to the measurement profile during the measurement, see “Controlling the Measurement” on page 76.

(The microphone situated on the underside of the Type 2250 will pick up your comments.) Recording stops when you release the pushbutton.

Note: A paperclip icon appears in the status field of the measurement and next to your project in Explorer when you have finished recording the comment. This is to indicate that the project has been annotated. Tap on the paperclip icon to see a list of all annotations in the project and tap on the loudspeaker icon in the annotation to hear the comment using the earphones plugged into the earphone socket.

Another method is to make a short written comment and attach it to the project you are working on. This is done before, during or after saving the measurement by tapping the Main Menu icon and then tapping on **Add Note** in the list of options. A blank 'note' screen will appear, where you can make written comments about the measurement, using the standard full character keyboard that appears at the bottom of the note screen. See the example in Fig. 3.10.

Note: When finished, tap on the icon to return to the measurement screen. A paperclip icon appears in the status field of the measurement and next to your project in Explorer. Tap on the paperclip icon to see a list of all annotations in the project and tap on the text icon in the annotation to view the comment.

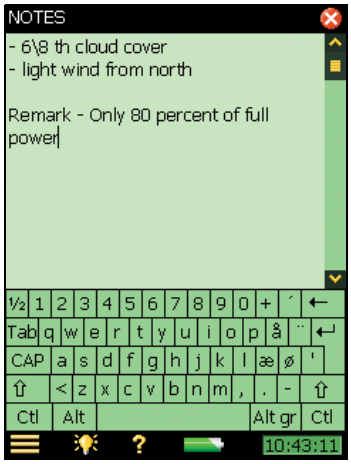


Fig. 3.10
Example of a written annotation that is attached to a measurement

To get more familiar with this process, try the following:

1) Make a new measurement (see "Point and Shoot" section on page 13 if unsure).
2) Make a short written comment and attach it to the new measurement (as previously described). Notice the paperclip icon in the data path.
3) Make a short spoken comment (as previously described).
4) Tap on the paperclip icon and check that you have two annotations – select one of them to see/hear the comment.

Chapter 4

Getting to Know Your Type 2250

What is a Sound Level Meter?

A Sound Level Meter (SLM) is an instrument that is designed to measure sound levels in a standardised way. A sound level meter comprises a microphone, a preamplifier, a main processor and a read-out unit.

The microphone converts the sound signal into an equivalent electric signal. The electric signal that the microphone creates is at a very low level, so it is made stronger with the help of a preamplifier before it is processed by the main processor.

Processing includes applying frequency and time weightings to the signal as specified by international standards, such as IEC 61672-1, to which Type 2250 conforms.

Frequency weighting adjusts how the sound level meter responds to different sound frequencies. This is necessary because the human ear's sensitivity to sound varies according to the sound's frequency. The most commonly used frequency weighting is A-weighting, which adjusts a signal in a way that best resembles the human ear's response at medium-range levels. It is the weighting required for nearly all environmental and workplace noise measurements, and is specified in international and national standards and guidelines. All of Type 2250's measurement parameters apply A-weighting, and a choice of C- or Z-weighting, except for the measurement of peak levels where a single weighting (typically the 'C' frequency weighting) is applied. In this case, C-weighting is used to take into account the energy present at low frequencies even when they are not particularly annoying.

Time weighting specifies how the sound level meter reacts to changes in sound pressure. It is an exponential averaging of the fluctuating signal, providing an easy-to-read value. Type 2250 applies the Fast, Slow and Impulse (or 'F', 'S' and 'I') time weightings, which are the required weightings according to the vast majority of international and national standards and guidelines.

Once the signal is processed through the weighting filters, the resulting sound pressure level is displayed in decibels (dB) referenced to 20 μPa on the instrument's screen. In Type 2250, the sound pressure level values are updated at least once per second.

Assessing a fluctuating noise level means getting a value for a level that is, in simple terms, the average level. The 'equivalent continuous sound level', L_{eq}, is known around the globe as the essential averaged parameter. L_{eq} is the level that, had it been a steady level during the meas-

urement period, would represent the amount of energy present in the measured, fluctuating sound pressure level. It is a measure of the averaged energy in a varying sound level. It is not a direct measure of annoyance, though extensive research has shown that L_{eq} correlates well with annoyance.

L_{eq} is measured directly with a hand-held analyzer, such as Type 2250 running 2250 Sound Level Meter Software BZ 7222. If an A-weighting filter is used, it is expressed as L_{Aeq}, defined as *the measurement of the equivalent continuous sound level using the A-weighted filter network*.

A full range of measurement parameters is given in Appendix B.

What is Hand-held Analyzer Type 2250?

Hand-held Analyzer Type 2250 is a Class 1 modular precision integrating-averaging sound level analyzer with an easy to use interface for quick and simple measurement setups. Type 2250 Sound Level Meter Software BZ 7222 is pre-installed on the analyzer for measuring a comprehensive set of parameters used for rating noise in terms of its impact on the environmental and working environments.

The more commonly used parameters, which cover a large range of applications, are either instantaneous measured parameters (available at any time) or timed measured parameters (measured within a controlled time interval):

Timed Measured Parameters

- Equivalent Continuous Sound Levels (L_{eq} – example: L_{Aeq})
- Peak Sound Levels (L_{peak} – example: L_{Cpeak})
- Maximum Time-weighted Sound Levels (L_{max} – example: L_{AFmax})
- Minimum Time-weighted Sound Levels (L_{min} – example: L_{AFmin})
- Percentile Levels (L_N – example: $L_{AF90.0}$)
- Sound Exposure Level (L_{AE})

Instantaneous Measured Parameters

- Instantaneous Time-weighted Sound Levels (L_p – example: L_{AF})
- Sound Pressure Levels (max levels once per second – example: L_{AF}(SPL)

Note: See Appendix B for a comprehensive list of all parameters.

2250 Sound Level Meter software BZ 7222 incorporates a simple user interface which is easy to learn and uses intuitive data storage and recall. Comprehensive security features means no loss of data, even on accidental power-off. Smart features are built-in for field use, for example, allowing you to personalise your measurements. 2250 Sound Level Meter software BZ 7222 also provides connectivity between your PC and other sound analysis software.

This highly versatile hand-held analyzer platform includes a range of optional software modules, that are enabled through easily activated software license keys. The combination of software modules and innovative hardware makes the instrument a dedicated solution for

performing all your high-precision measurement tasks. The following optional software module is covered in this manual:

2250 Frequency Analysis Software Module BZ 7223

This software module allows real-time frequency measurements in 1/1- and 1/3-octave bands, making it a simple matter to, for example, select suitable hearing protection, qualify noise from heat and ventilation systems and assess tonality.

2250 Logging Software Module BZ 7224

This software module allows logging of broadband and spectral data[a] to obtain a time history for later analysis, for example, for use in environmental noise as well as workplace noise assessment. It allows free selection of up to 10 parameters to log at periods from 1 s to 24 h. Results are logged directly to CF or SD memory cards.

2250 Sound Recording Option BZ 7226

This option allows recording of sound during measurement using one of the software modules BZ 7222, BZ 7223 or BZ 7224. The sound recording can be controlled manually or by using an external trigger signal. The recording can also be triggered when a measured parameter exceeds a preset level (BZ 7224 only). The recorded sound can be played back and listened to using the supplied earphones, HT 0015. Sound is recorded directly to CF or SD memory cards.

Built-in Help

If you need more detailed information at any time during operation, tap the Help icon on the instrument's screen. The resulting screen will explain that particular item in much more detail. You can scroll up and down the explanatory text using either the ▼ and ▲ pushbuttons, or the scrollbar on the screen. Return to the normal display screen by tapping .

Once in the help system, you can access the list of installed software versions and licenses, together with information about the hardware. This information is always available and is accessed by selecting **About** from the top of the display.

If you need to view any of the previous 10 screens you have visited in the help system, press the icon at the top of the display.

What is Utility Software for Hand-held Analyzers BZ 5503?

Utility Software for Hand-held Analyzers BZ 5503 functions as the link between the Type 2250 and reporting software on a PC, such as Noise Explorer Type 7815, Evaluator Type 7820/21 or Protector Type 7825.

The software enables you to do the following:

- setup or control Type 2250 from a PC
- retrieve data from Type 2250

a. Requires Frequency Analysis Software BZ 7223

- manage and archive data from Type 2250
- export data to Type 7815, Type 7820, Type 7825 or Microsoft® Excel
- update the software in Type 2250
- install license for use of software modules in Type 2250

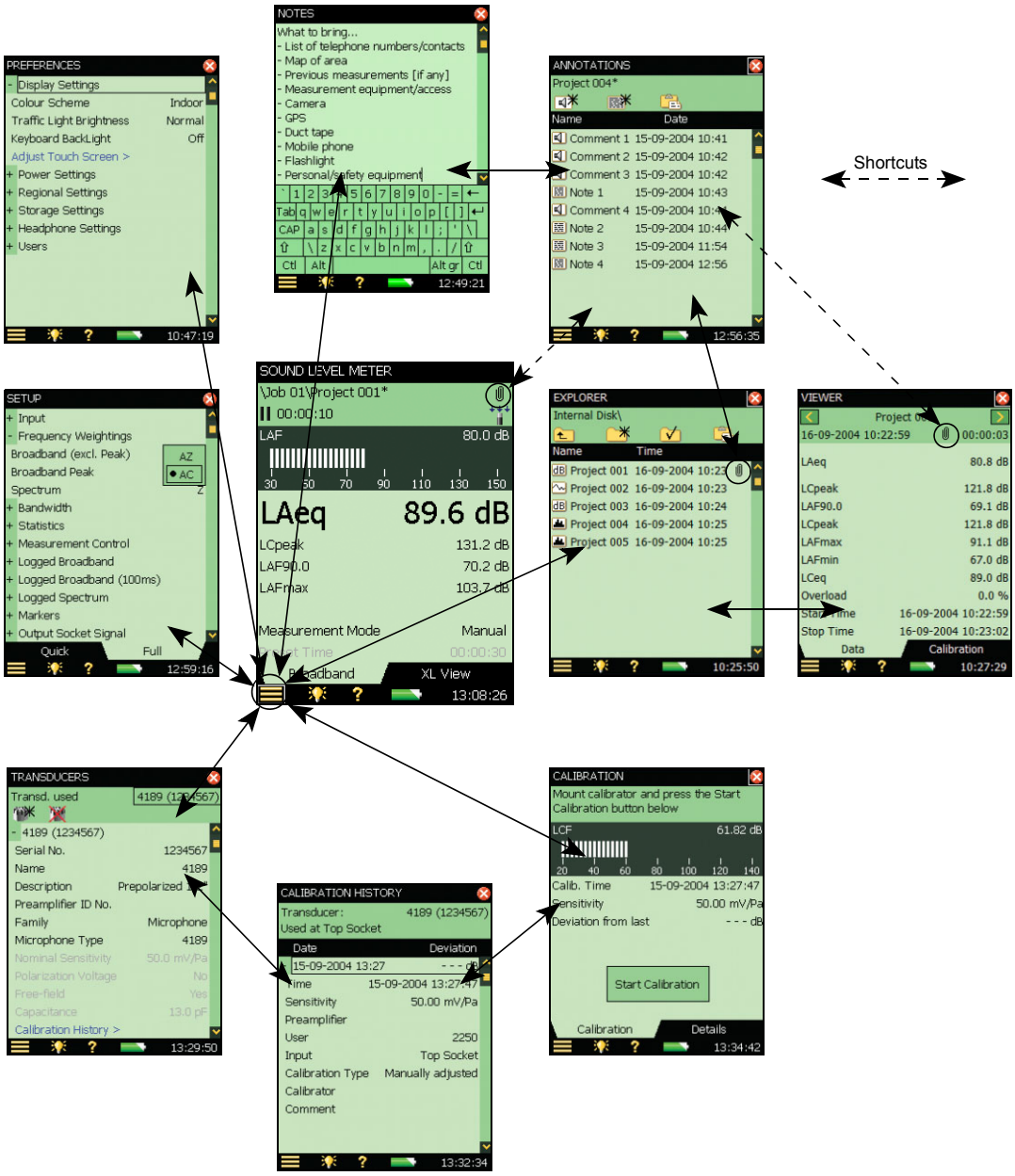
Utility Software for Hand-held Analyzers BZ 5503 is supplied on the Environmental Software CD-ROM (BZ 5298), which is included with your Type 2250.

Basic Principles when using Type 2250

Navigation Principles – 'Star' Navigation Concept

The main principle is that all the main menus are accessible via a single tap of the stylus. The Main Menu icon  forms the centre of the 'star' navigation concept, see Fig. 4.1:

Fig. 4.1 *The 'Star' navigation concept*



This configuration gives you immediate access to screens you need most, i.e., those you will need to perform, save and document your measurements. The Main Menu allows you to navigate to the following screens:

- Explorer
- Setup

- Preferences
- Transducers
- Calibration
- New note

In addition, the Main Menu also allows you to perform the following actions:

- Save Template
- Lock Keys and Screen
- Log Off

Explorer

The **Explorer** screen is accessed from the Main Menu, and gives you access to the instrument's Data/Project manager. This allows you to view the overall project structure, including job folders and projects, and to view all the individual measurements. When you have finished, press to return to the measurement screen.

You can tap on any measurement file to view the saved measurement and if there are any voice or text annotations attached, these can be viewed by tapping the paperclip icon visible next to all measurement files with attachments. When you have finished reading or listening to the comments, press to return to the **Explorer** screen.

Setup

The **Setup** screen is accessed from the Main Menu and gives you access to the various setup parameters, such as frequency weightings, control of the measurement, bandwidth, statistics and the type of input currently connected. You can change these as required, see "How to Change Parameter Values" on page 34.

The *Full* tab at the bottom of the screen allows you to view the complete list of setup parameters, while the *Quick* tab allows you to access the more frequently used parameters. When you have finished viewing or updating the parameters, press to return to the measurement screen.

Changes made to the setup will only be applied temporarily, i.e., until you select another project template or open another project to re-use the setup from that project. However, if you want the setup changes to be saved in the current template, select the **Save Template** option from the Main Menu .

Note: If you make changes to the setup that you do not want to keep, (and you have not yet selected **Save Template**), you can undo them by selecting the template again from the Project Template bar at the top of the screen.

Preferences

The **Preferences** screen is accessed from the Main Menu and gives you access to the instrument's preferences (if Multi User is disabled) or your own preferences (if Multi User is enabled). These include things such as regional settings, appearance of the screen, power management, user profiles and language. You can change these as required, see "How to Change Parameter Values" on page 34. For more information refer to "Setting your Preferences

on Type 2250" on page 51. When you have finished viewing or updating the parameters, press to return to the measurement screen.

Transducers

The **Transducers** screen is accessed from the Main Menu, you can view/set which transducer is connected to the instrument and add new ones if required. Details can be changed for existing transducers or entered for new ones, see "How to Change Parameter Values" on page 34. When you have finished viewing or updating the details, press to return to the measurement screen.

When a transducer is selected, you can tap on the *Calibration History* link at the bottom of the transducer details and open the *Calibration History* screen, see Fig.4.1. This screen includes the calibration history for the transducer (i.e., microphone) that is currently selected. When you have finished viewing or updating the details, press to return to the **Transducers** screen.

Calibration

The **Calibration** screen is accessed from the Main Menu, and gives you access to the instrument's calibration procedure. To calibrate the instrument, follow the instructions in the status field. For more information refer to "Acoustic Calibration" on page 37. When you have finished calibrating or viewing the details, press to return to the measurement screen.

The *Calibration* tab at the bottom of the calibration screen allows you to perform and monitor the calibration, while the *Details* tab allows you to view the details of the calibration and the calibrator that are being used to calibrate the instrument. While you are viewing the *Details* tab, you can tap on the *Calibration History* link at the bottom of the calibration details and open the *Calibration History* screen, see Fig.4.1. This screen includes the calibration history for the currently selected transducer, press to return to the *Calibration* screen.

New Note

The *Notes* screen is accessed from the Main Menu by selecting **New Note**. This screen allows you to create a text annotation that you can attach to your measurement. Text is inserted using a character keyboard, similar to the one covered in "How to Change Parameter Values" on page 34. When you have finished, press to return to the measurement screen.

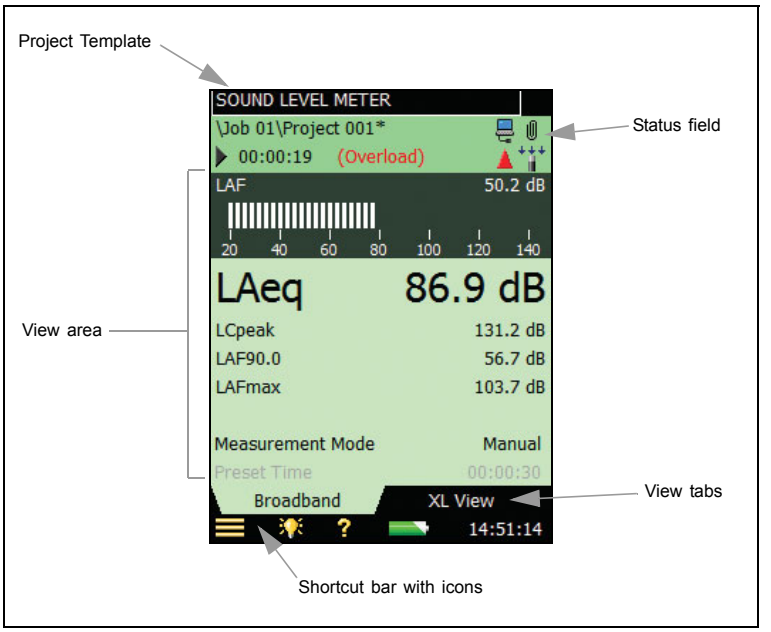
The Display Screen

During normal operation, you will use the display screen to view your measurements and carry out a variety of functions, which are described in the following sections.

CAUTION: The touch-sensitive screen is susceptible to damage from sharp objects, such as pencils, fingernails, etc., we therefore recommend you use the stylus provided to activate items on screen. See also "Use of Stylus and Navigation Pushbuttons" on page 33.

A typical screen is shown in Fig.4.2.

Fig. 4.2
Typical screen when making a measurement



The key areas, starting at the top of the screen, are as follows:

Project Template Bar

This bar displays the name of the Project Template which contains all the screen settings and measurement setup for the current project. Tap on the text to open a drop-down list containing all the available templates. If you make any changes to the setup in a template an '∗' will appear next to the template name to indicate that the new settings have not been saved. Select **Save Template** from the Main Menu to save the settings in the current template.

Status Field

The area just below the Project Template bar is called the Status field. Depending on the template, this field displays status information using up to three lines of text, as follows:

First Line:

- Path and name of the current project. (See "Description of Jobs and Projects" on page 43.) Tap it to change the name of the project. To change the path, tap the Main Menu icon and select **Explorer** from the list of options, navigate to the desired job (path) and tap the icon to save this path as the default measurement path. As in the project template, an '∗' will appear next to the project name to indicate that the project has not been saved. Press the **Save** push-button if you want to save the measurement
- The PC icon indicates connection to a PC
- The commentary icon indicates when a spoken commentary is being recorded, together with an indication of the available recording time
- The recording icon indicates when the measurement signal is being recorded

- A paperclip icon indicates that a spoken or written comment is attached to the project. Tap the icon to view, or listen to, the comment

Second Line:

- Measurement state represented as icons: Stopped ■, Running ▶ and the Pause icon ❙❙
- Elapsed time of the measurement
- Feedback on the action of pressing the following pushbuttons: **Reset**, **Back-erase**, **Start/Pause** and **Save**
- Indication that the measurement microphone is uncalibrated. In this case the word *Uncal.* appears in the Status Field
- Four icons are used to represent whether, or not, the windscreen is fitted and whether you are measuring in a free-field or diffuse field. For example, no windscreen fitted, measuring in a free-field – ; no windscreen fitted, measuring in a diffuse field – ; windscreen fitted, measuring in a free-field – ; windscreen fitted, measuring in a diffuse field –
- Immediate textual feedback on overload situation and latched overload indicated with an overload icon ▲

Third Line: Used for Logging, see “Status Field” on page 78.

Central View Area

The Central View Area contains the screens required for a particular measurement, such as bar graphs, result readouts and various frequently used setup parameters (i.e., *Meas. mode*). The template defines the content of this area. More than one screen can be used for displaying the information. Select the screen using the View Tabs at the bottom of the View area.

Changes made to the screens will only be applied temporarily, i.e., until you select another project template or open another project to re-use the screen from that project. However, if you want the screen changes to be saved in the current template, select the **Save Template** option from the Main Menu .

Note: If you make changes to the screen that you do not want to keep, (and you have not yet selected **Save Template**), you can undo them by selecting the template again from the Project Template bar at the top of the screen.

Shortcut Bar

The Shortcut Bar, at the bottom of the screen, displays a number of fixed icons that are always accessible. These include:

- Main Menu icon , giving access to the Main Menu. This allows you to navigate to a specific function, see description earlier under Navigation Principles
- Backlight icon , allows you to select a backlight level
- Help icon , a quick way to get context-sensitive help from any screen by tapping on the icon at the bottom. Closing the help window will return you to the previous screen
- Battery/power status icon , shows the condition of the battery. All green shows a fully charged battery, while red means power levels are low. Tap the icon to get more details of the

battery condition. (When the Power Supply lead is connected, the  icon will be displayed in place of the battery icon.)

- The clock in the lower right corner displays the current time. Tap the readout to get details of the time and date, or to set the clock

Use of Pushbuttons for Controlling Measurements

The design of the Type 2250 is such that the layout of the pushbuttons has been optimised for single-handed operation.

Reset Pushbutton

Use the **Reset** pushbutton to reset a measurement, i.e., to reset all detectors, averagers, maximum and minimum hold, etc. If the measurement is paused (i.e., Pause icon || is displayed in the status field), then the measurement reverts to a 'stopped' state after a reset, (i.e., stopped icon ■ displayed with a zeroed readout). If the measurement is running, then the measurement will be automatically re-started after the reset.

Start/Pause Pushbutton

Use the **Start/Pause** pushbutton for controlling the measurement. The function of this key depends on the current measurement state, see Table 4.1:

Table 4.1
Start/Pause pushbutton functions

Current Measurement State	Function of Start/Pause Pushbutton	Next Measurement State
■ Stopped	Start the measurement	▶ Running
▶ Running	Pause the measurement	|| Pause
|| Pause	Continue the measurement	▶ Running

Save Pushbutton

Use the **Save** pushbutton to save the measurement data together with the current project template (including all the screen settings and setup information) and the calibration documentation.

Pressing **Save** will affect the pause and running states. In both cases the measurement state will be 'stopped' shortly after pressing the pushbutton (stopped icon ■ displayed).

Back-erase Pushbutton

For BZ 7222 and BZ 7223 Software:

Use the **Back-erase** pushbutton to erase the last 5 seconds completely from the measurement. (This includes, of course, overload indications you would like to erase.)

If used when the current measurement is running, then the measurement will be paused. The status field displays *Pause, Back erase* briefly, and then displays the shortened elapsed time along with the Pause icon ||.

For BZ 7224 Software:

Pressing the **Back-erase** pushbutton will start drawing an Exclude Marker on the display, see "Marking Sound Categories" on page 80. Pressing it again will stop drawing the marker on the display (toggle function).

On-screen Feedback and Traffic Light

Feedback is given on screen in the Status Field, see Fig.4.2, and the Traffic Light indicates important states of the instrument, see Table 4.2:

Table 4.2
Traffic Light Indications

State	Light Scheme
During power-on or loading template	Nothing
■ Stopped. Ready to measure	Short yellow flash every 5 s
▶ Awaiting trigger, searching for calibration signal	Short green flash every second
▶ Running measurement, everything OK	Steady green light
❚❚ Pause. Measurement not saved	Slow yellow flash on 1/2 s, off 1/2 s
▲ Overload	Fast red flash

Use of Stylus and Navigation Pushbuttons

The stylus and navigation pushbuttons are used for setting up Type 2250, navigating through the screens and managing the results.

A number of items that appear on the screen (parameter values or icons) can be selected, updated and activated. For instance, a new parameter value can be selected from a drop-down list. The selection and activation of items on the screen can be done in two ways:

- tapping once on the item on the screen will select and activate it, or
- move the field selector around using the navigation keys until the item you want is highlighted. Then press the **Accept** pushbutton to activate it

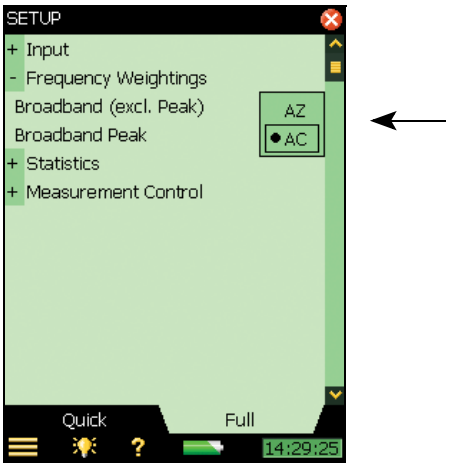
You can choose to use the stylus or the pushbuttons, depending on your preference and the measurement situation. (For instance, if the amount of noise generated by the instrument needs to be kept to an absolute minimum, consider using the pushbuttons rather than the stylus – this is because tapping of the stylus on the touch-sensitive screen may create extra noise. However, if speed is of major importance, the stylus can navigate through the setup and measurement screens quicker.)

Throughout the manual we have described how to perform the measurement procedures using the stylus only, but you may also use the alternative method (using the Navigation and Accept pushbuttons) if you prefer.

How to Change Parameter Values

Most parameter values are changed by selecting a new value from a drop-down list, which appears when the parameter field is selected. See the example in Fig. 4.3.

Fig. 4.3
Changing parameter values



Stylus Usage

Tap on the value you want in the drop-down, or tap outside the list to cancel the selection.

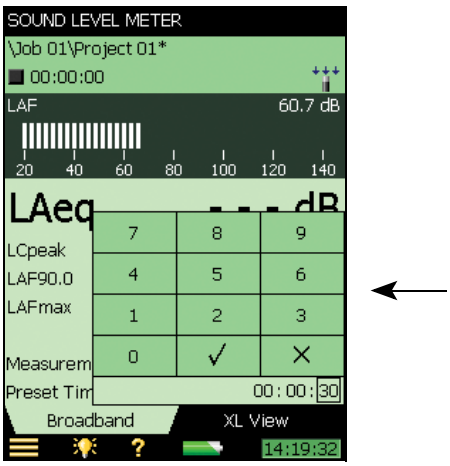
Pushbutton Usage

Use the navigation pushbuttons (up arrow ▲, or down arrow ▼) to select the value you want and press the **Accept** pushbutton ✓ to activate it. Use the left arrow ◄ to cancel the selection.

Number Keyboard

When activating a number, a number keyboard appears, see Fig. 4.4.

Fig. 4.4
Number keyboard as it appears on the screen

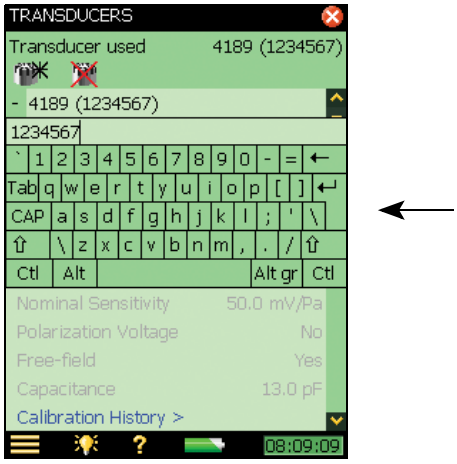


Tap on the digits or use up arrow ▲/down arrow ▼ to increment/decrement the number. Use left arrow ◄/right arrow ► to select other digits if necessary. Press the **Accept** pushbutton ✓ or tap the ✓ button on the screen to enter the number for the parameter. Tap on the ✕ button on the screen, or outside the number keyboard to cancel the change of value.

Character Keyboard

When activating a text value, a standard full character keyboard appears on the screen, see Fig. 4.5.

Fig. 4.5
Character keyboard as it appears on the screen



The character keyboard has all the functionality of a normal keyboard, enter text as required by tapping the individual keys with the stylus. Tap the Enter key ↵ to accept the changes, or tap outside the keyboard to cancel.

Locking the Pushbuttons and Display

The pushbuttons and display can be locked to prevent inadvertent operation.

To Lock: Select the **Lock Keys and Screen** option from the Main Menu .

To Unlock: Press the left arrow pushbutton ◄, followed by the right arrow pushbutton ►, then the **Accept** pushbutton ✓.

If you attempt to press a pushbutton, or tap on the screen, while the instrument is locked, an information window pops up with instructions on how to unlock it.

Chapter 5

Calibration

Introduction

Calibration is an adjustment of your sound level meter to measure and display correct values. The sensitivity of the microphone as well as the response of the electronic circuitry can vary slightly over time, or could be affected by environmental conditions such as temperature and humidity. While you are unlikely to ever experience a large drift or change in sensitivity with Type 2250, it is nevertheless good practice to perform regular calibrations, normally before and after each set of measurements. Often calibration is required by measurement standards, such as IEC 61672-1.

Acoustic Calibration

Acoustic calibration is the preferred calibration method, particularly when standards and regulations require calibration before a measurement. The method involves applying an acoustic signal of known magnitude and frequency to the microphone, which calibrates all the instrument's components (microphone, preamplifier and electrical circuitry).

Sound Level Calibrator

To perform the acoustic calibration use Sound Level Calibrator Type 4231. It provides a stable sound pressure at 1 kHz and has minimal susceptibility to environmental factors. The procedure itself is relatively simple, and on Type 2250 the procedure is referred to as the Standard Calibration procedure.

The procedure for performing an acoustic calibration and instructions on how to fit the calibrator are given in the following section.

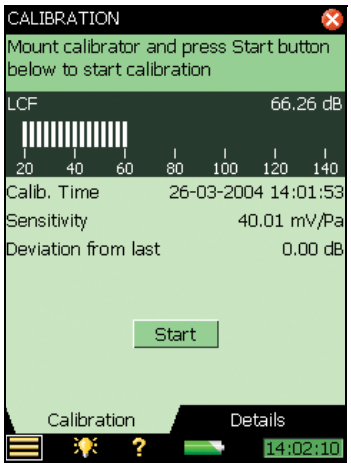
Standard Calibration

1) Stand away from loud sound sources that may interfere with the calibrator's signal.

2) Switch on Type 2250 by pressing ⏻.

3) Tap on the Main Menu icon and select **Calibration** from the list of options. The following screen will appear:

Fig. 5.1
Initial Calibration screen



The screen contains a bar graph showing the actual sound pressure level and three place-holders for displaying information about the last calibration.

4) Following the first part of the instruction in the status field, fit Sound Level Calibrator Type 4231 carefully onto the microphone of the Hand-held Analyzer. (To avoid handling vibrations to disturb the calibration rest the assembly in a roughly horizontal position on a table or other flat surface.)

   Ensure that the calibrator fits snugly on the microphone.

5) Switch on the Calibrator. Wait a few seconds the level to stabilise.

6) Press the Start button on the screen to start the calibration.

   Note: *Detecting level...* appears on the screen as feedback.

7) While Type 2250 is searching for the calibration signal and the signal level is stabilising, the 'traffic light' indicates a short green flash every second. When the level is stable, the traffic light indicates a steady green and the signal is measured and used for calibration. **Once the calibration has been completed successfully, the traffic light indicates a short yellow flash every 5 seconds.** The *Sensitivity* is automatically calculated and displayed in a pop-up together with the deviation from the last calibration. Press *Yes* to accept and use the new sensitivity and save it in the calibration history. Press *No* to disregard the new calibration and continue with the old calibration.

   If the calibration deviates more than ± 1.5 dB from the initial calibration, then the calibration is stopped without changing the calibration of the instrument. The traffic light will indicate a fast flashing red and an error description will appear in the status field.

   Hint: If the microphone is separated from Type 2250 using a microphone extension cable then place Type 2250 so it can be seen from the location of the microphone. Start the calibration process, (select the **Calibration** screen and press the Start button on the

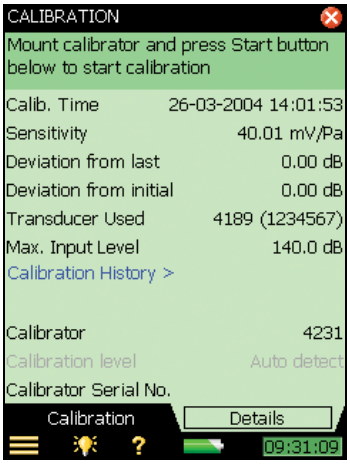
screen, then go to the microphone and fit the Calibrator onto the microphone, switch on the Calibrator and monitor the traffic light on the Type 2250, as discussed previously.

8) Once you have completed the calibration, press the Exit button and remove the calibrator. It will automatically switch off after a few seconds.

Calibration Settings

Select the *Details* tab on the **Calibration** screen to view the calibration details, see Fig. 5.2.

Fig. 5.2
Calibration details screen



This screen displays the following information:

- Details of the last calibration: date, sensitivity, deviation from last calibration and deviation from initial calibration
- The connected transducer: type and serial number

  Note: you select a new transducer by tapping on the Main Menu icon and selecting **Setup**, followed by *Input*)
- A *Calibration History* link: which is provided to enable you to view a history of transducer and calibration settings, see below
- *Max. Input Level*: the maximum sinusoidal input level to be measured without overload indication

The calibration settings can be adjusted as follows:

- *Calibrator*: select between Type 4231 and a custom calibrator
- *Calibration Level*: type in the specific level of your custom calibrator. If you are using Type 4231 calibrator, and the microphone being used is connected to the top socket, then the level of the calibrator is automatically detected, (shown as *Auto detect* on the screen).

  Note: The *Auto detect* setting enables the calibration process to automatically detect the calibration level. For free-field types of microphones (like Type 4189) the calibration level from a Type 4231 Calibrator is either 93.85 dB or 113.85 dB. For diffuse or pressure field types, the calibration level is either 94 dB or 114 dB. The calibration process automatically

determines the correct level.

- *Calibrator Serial Number*: type in the serial number for your calibrator. The calibrator will be documented in the calibration history

Electrical Calibration

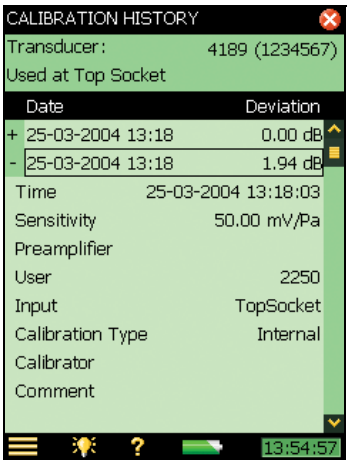
If no sound level calibrator is available (or a known amplification is introduced, i.e., by analyzing a tape recorded signal) then you can type the sensitivity directly into the *Sensitivity* field. Type 2250 will be regarded as un-calibrated and the text '*Uncal.*' will appear in the status field.

Calibration History

You select the calibration history by tapping on the *Calibration History* link on the Calibration Details screen, see Fig. 5.2.

Type 2250 saves the last 20 calibrations, plus the initial calibration, which can be viewed on the *Calibration History* screen, see Fig. 5.3. When you have finished, tap to return to the calibration details screen and then tap again to return to the measurement screen.

Fig. 5.3
Calibration History screen

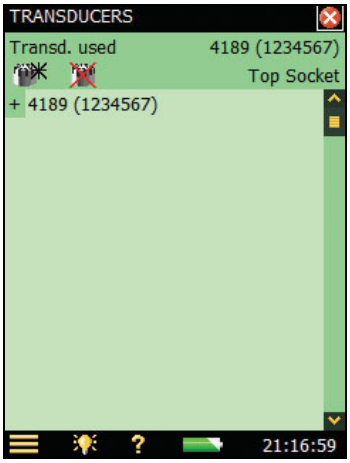


Transducer Database

The specifications for Microphone Type 4189 (and Preamplifier ZC 0032), which come fitted in the top socket of Type 2250, are described in a transducer database.

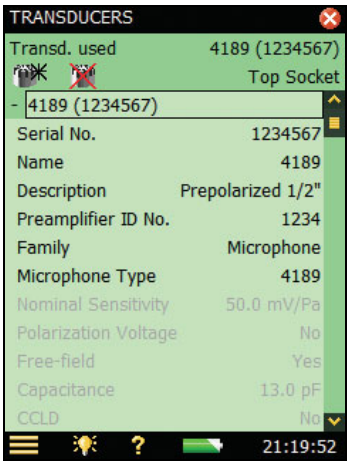
1) Select the Transducer Database by tapping the Main Menu icon and choosing **Transducers** from the list of options. The following screen will appear:

Fig. 5.4
Transducer Database screen



2) Tap on the transducer name/number, or select the plus icon + next to name/number, to view the details in the database, see Fig. 5.5.

Fig. 5.5
Details in the Transducer Database



All the details for the currently selected microphone can be found in the database. You can add other transducers by tapping on the Add New Transducer icon and filling in the details of your particular transducer parameters. See "Transducer Setup" on page 122. This is done by selecting the item from the drop-down list that appears on some parameter fields, or by entering the data via the keyboard that appears on other parameter fields.

A number of parameters are set automatically for a known microphone type, such as Type 4189.

Note: If the microphone type is known to the Type 2250 (as in the example in Fig. 5.5, where Type 4189 details are known), then the parameters *Nominal Sensitivity*, *Polarization Voltage*, *Free-field*, *Capacitance* and *CCLD* are set automatically. See details in Appendix C. The analyzer can then make sound field correction and windscreen correction as specified in the setup.

To confirm which type of correction is being applied, an icon is displayed in the measurement Status field, as described on page 31. If the microphone is unknown to Type 2250, no corrections can be made and no icon appears in the Status field. The parameters mentioned above have to be set manually (i.e., typed in). We recommend that you insert the value for Nominal Sensitivity directly from the calibration chart. Nominal Sensitivity is used in the automatic level detection calculations, when calibrating using the Type 4231 Calibrator, to determine whether the level is 94 or 114 dB.

In the top line of the status field you can select which transducer is currently connected to Type 2250. This can also be done via the **Setup** screen by selecting *Input,* then selecting the transducer in the *Transducer Used:* field.

In the second line of the status field you can select whether the transducer is connected to the top socket or the rear socket of Type 2250. This can also be done via the **Setup** screen by selecting *Input*, then selecting the socket in the *Input:* field.

To change which input the transducer uses to connect to Type 2250, tap the Main Menu icon and select **Setup** from the list, next tap on the *Input* value field and finally, choose the required input from the drop-down list: *Top socket* or *Rear Socket*. (*Rear Socket* refers to the **Input** socket on the connector panel of Type 2250).

At the bottom of the parameter list you can select the calibration history for the currently selected transducer by tapping on the *Calibration History* link. See “Calibration History” on page 40 and Fig. 5.2.

You can delete a transducer by tapping on the Delete Transducer icon and selecting the transducer to delete from the drop-down that appears.

Note: Only transducers that are not connected can be deleted. The calibration history will also be deleted.

When you have finished, tap to return to the measurement screen.

Chapter 6

Data Management

Organising Measurements

Description of Jobs and Projects

When saving a set of measurement results, they are organised together with setup information, calibration information, annotations and sound recordings in a project.

A project contains the following :

- Measurement results:
  - — Broadband values (for example, L_{Aeq}, L_{AFmax}, L_{AFmin}, etc.)
  - — Frequency spectra (if Frequency Analysis software BZ 7223 is enabled on your Type 2250 and you have selected a Frequency Analyzer template)
- Measurement Setup
- Display Setup (parameters you have selected)
- Information on the microphone
- Calibration
- Annotations – Commentary (attached to measurements as required)
- Annotations – Text (attached to measurements as required)
- Sound Recordings (attached to measurements as required)

The Project name is automatically created by combining the Project Name Prefix with a number (starting from 001), i.e., Project 001 for the first project, Project 002 for the next, etc.

If preferred, the Project Name Prefix can be changed from the default name of ‘Project’. To do this, tap the Main Menu icon  , then **Preferences** followed by **Storage Settings** to reveal the Project Name Prefix. Tap on the current name to reveal a keyboard for you to type in the required name.

Projects are saved in folders which are called ‘jobs’ on your Type 2250. These are similar to folders in the Windows® filing system.

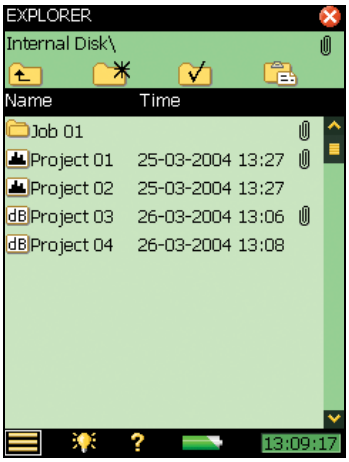
Jobs can be created in the internal memory, on a Secure Digital (SD) Card or on a Compact Flash (CF) Card.

Navigating in Jobs

On Type 2250, a results browser called Explorer is used to navigate through the jobs and projects.

To view all jobs and projects, tap the Main Menu icon and select **Explorer** from the list of options. A screen similar to Fig.6.1 will appear.

Fig.6.1
The Explorer screen



The example from Explorer in Fig.6.1 displays a list of jobs and then some projects which have not been stored under a job name.

The topmost line in the status area (*Internal Disk*\ in the example in Fig.6.1) shows the location in the memory.

The next line in the status area contains 4 icons for navigation.

Tap the icon to go up one level in the job-levels. The top level is the Memory level, where physical memory devices can be selected. You can select between:

- Internal Disk
- SD Card (if available in SD Slot)
- CF Card (if available in CF Slot)

If Multi-user is enabled (see Chapter 8), then each user can access data on the three devices. However, a user cannot see or access jobs for other users.

To go down one level (i.e., exit the Memory level), you tap on the job name (*Internal Disk* in this case) and select *Open* from the dropdown list - or you simply tap on the memory icon next to *Internal Disk*.

Tap the icon to create a new job folder. The first job folder name will be 'Job 01', subsequent job folders will be labelled 'Job 02', 'Job 03', etc. You can rename the job folder name by tapping on the name and selecting *rename* from the dropdown list. Use the keyboard to key in a new name – accept by tapping on the Enter key .

To go down one level (open a job), you tap on the job name in the list and select *Open* from the dropdown list – or you simply tap on the job icon to the left of the job name.

You can move a job/project (and its content) to another job by tapping the job name/project name and selecting *Cut* from the dropdown list. Then navigate to the job you want as the new holder of the moved job/project and tap on the Paste icon  , or navigate to the level above and tap on the job name and select paste from the dropdown list.

In order to copy a job/project do as described above, but use *Copy* instead of *Cut* from the dropdown list.

Select *Delete* from the dropdown list in order to delete the job/project and all of its contents.

Selecting Default Measurement Job/Path

Tap the  icon to select the current job as the default measurement job, where all projects will be saved when you press the **Save**  pushbutton. The job name, followed by the current project name, will appear in the topmost line in the status area to confirm which job you have selected.

Recalling Measurements

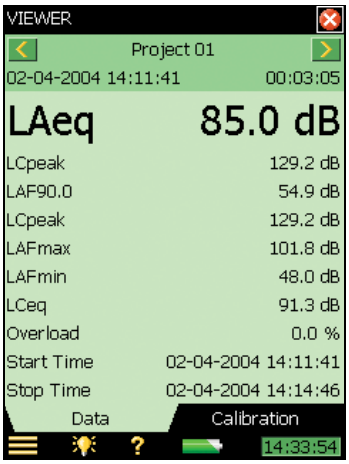
You can recall your measurement results in one of two ways:

- To display the measured results (and calibration details) only, use the results viewer – this can be done during an ongoing measurement and is a convenient way of browsing several sets of measurement data, see below
- To re-use setups from previously saved projects, use the *Open* command in Explorer – this will recall the project template (display settings and measurement setup used on the saved results) along with the results. This will, however, stop and reset the current measurement

Viewing Data

Use Explorer to locate the project with the results you want to view, then tap on the project name and select *View* from the dropdown that appears (or simply tap on the project icon). This will open the Viewer (Fig. 6.2).

Fig. 6.2
The Viewer



The project name is displayed at the top of the Viewer, along with two buttons: and . These are used to view results on the previous or next project in the job folder.

The line below this shows the start time and elapsed time for the measurement.

The next line contains spectrum information (Frequency Analysis only) and finally some broadband values. Tap on the spectrum parameters or broadband parameters to select other parameters.

The *Calibration* tab allows you to view the calibration details for the measurement.

You can view data on projects without disturbing the ongoing measurement.

To exit the Viewer, tap on the icon.

Re-using Setups from Projects

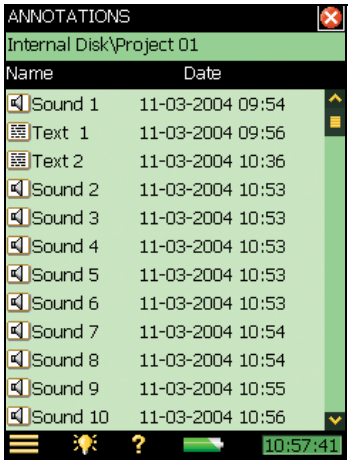
Use Explorer to locate the project with the setup you want to re-use, then tap on the project name and select *Open* from the dropdown that appears. This will stop and reset the current measurement and load the project including all setups and data. You are now using the same screens as the ones you were using just before you saved the data. Use the screens to browse the results. Pressing **Start/Pause** will start a new measurement using the setups from the project.

You can save the setup information in a template by pressing the Main Menu icon and selecting **Save Template**, see “What is a Project Template?” on page 14.

Viewing or Listening to Annotations

Use Explorer to locate the project with the annotations you want to view/hear, then tap on the project name and select *Annotations* from the dropdown that appears (or simply tap on the annotations icon). This will show all annotations attached to the project:

Fig. 6.3
Example of an annotation attached to a project



The icon represents a verbal annotation, or commentary. Tap the annotation name and select *Play* from the dropdown that appears (or tap the icon) to play the commentary using the headphone output.

Note: you can also rename or delete annotations, or copy or move annotations to other projects or jobs.

The Text icon represents written annotations, or notes. Tap the annotation name and select *Open* from the dropdown that appears (or tap the icon) to open the Notes Editor. View the comments and, if required, edit the comments using the simulated keyboard that appears at the bottom of the screen. Tap on the icon to accept the changes and return to the previous screen.

Inserting Annotations Using Explorer

In addition to inserting commentary or text annotations on your current measurement, see “Document your Measurement” on page 20, you can insert commentary or text annotations on projects or jobs using Explorer.

Tap on a job or project name and select *Add note* or *Add Comment* from the drop-down that appears.

Chapter 7

Transferring Data to Your PC, Post-processing and Reporting

Transferring Measurement Data to Your PC

Utility Software for Hand-held Analyzers BZ 5503 is used for all communication between your PC and Type 2250. Connect Type 2250 to your PC using the supplied USB cable AO 1476 or using a modem connection (see Chapter 8).

Use this software to:

- Transfer measurement data and templates from Type 2250 to your PC, and vice versa
- Organise data on Type 2250
- Create users on Type 2250
- Upgrade software on Type 2250
- Install software licenses on Type 2250

Using this software, measurements on Type 2250 can be controlled from your PC and displayed on-line, using the same user interface on the PC as on Type 2250.

Data transferred to the PC are organised in Archives.

View the measurement data in the Archives or edit the project templates.

Data in the archives can be exported to:

- Noise Explorer Type 7815
- Evaluator Type 7820
- Protector Type 7825
- Predictor Type 7810
- Lima Type 7812
- Acoustic Determinator Type 7816
- Microsoft® Excel for further post-processing and reporting

Sound Recordings can be input to the Brüel & Kjær PULSE™ Analyzer Platform for further analysis – please contact your local Brüel & Kjær representative for further information.

Post-processing and Reporting

The software modules are further enhanced by Brüel & Kjær's post-processing software suite, including Utility Software for Hand-held Analyzers BZ 5503 for data transfer, setup and remote display (included with your Type 2250), Noise Explorer Type 7815 for viewing data, Evaluator Type 7820 for assessing environmental noise and Protector Type 7825 for assessing workplace noise.

For further information, please refer to the on-line help included with the relevant PC Software. This software is supplied on the Environmental Software CD-ROM (BZ 5298), which is included with your Type 2250.

Chapter 8

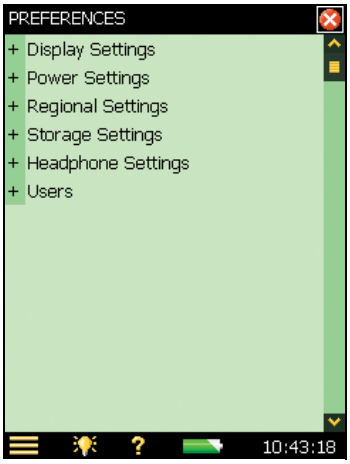
Advanced Use of Type 2250 – Tips and Tricks

Setting your Preferences on Type 2250

You can specify a number of parameters controlling display settings, power settings, regional settings, storage settings and users. These parameters are grouped together under Preferences.

You access preferences by tapping on the Main Menu icon and selecting **Preferences** from the list of options. The following screen will appear:

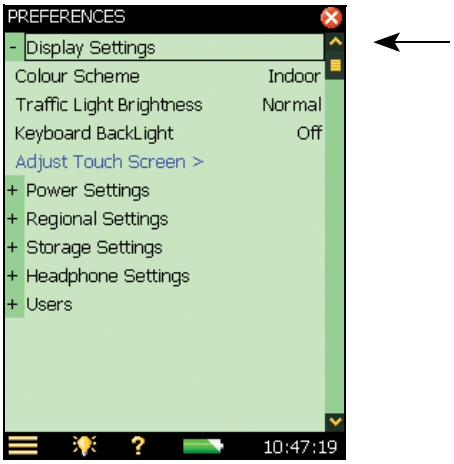
Fig. 8.1
The Preferences screen



Display Settings

Tap on *Display Settings*, or select the plus icon + next to *Display Settings*, to expand the list of available display settings, see Fig. 8.2. These parameters allow you to select a suitable colour scheme for your display. This may vary, depending on the lighting conditions at the time of the measurement.

Fig. 8.2
Display Settings screen



There are five different colour schemes you can choose:

- The *Indoor* scheme – a colour scheme for everyday use
- The *Alhambra* and *Arcade* schemes – alternative colour schemes, designed for everyday use
- The *Outdoor* scheme – a scheme for very bright conditions, where you need as much contrast as possible on the screen
- The *Night* scheme – a scheme which is made especially for measuring under very dark conditions, where you need to keep your night vision while measuring

For each colour scheme you can select the optimum choice of brightness for the traffic light (e.g., *High* for *Outdoor* in bright light conditions and *Low* for *Night* in dark conditions) and you can select whether to have backlight on the keyboard, or not. In very bright lighting conditions you will not be able to see the backlight, so set it to *Off* to save some power.

When you have made your choices, tap on *Display Settings*, or on the minus icon -, to collapse the list.

In addition, a link is provided in *Display Settings* to adjust the touch-sensitive screen. Tap on *Adjust Touch Screen >* to display a full screen with guidance on how to tap on a cross five times at different places on the screen. At the end of the adjustment procedure you have the choice of saving the values or cancelling the adjustment.

Power Settings

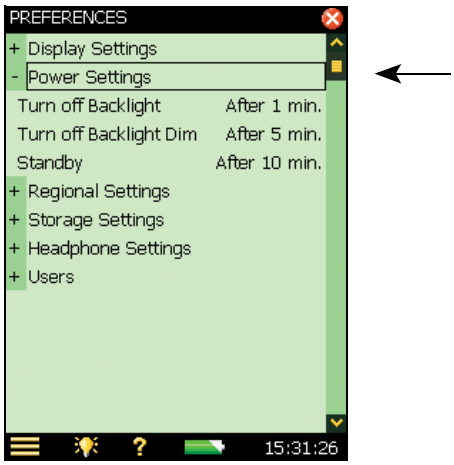
Type 2250 has an advanced power management function, that takes care of supplying the different circuits with adequate power and switches off those circuits that are not in use. These power management functions can be changed via the *Power Settings* screen, see Fig. 8.3.

Tap on *Power Settings*, or select the plus icon + next to *Power Settings*, to expand the list of available power settings.

There are three different power settings to choose from:

- *Turn Off Backlight*
- *Turn Off Backlight Dim*
- *Standby*

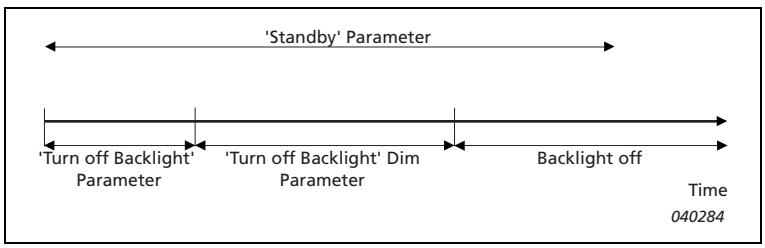
Fig. 8.3
Power Settings screen



The backlight will be switched on as soon as you operate the instrument, either by using the keyboard or the stylus on the touch-sensitive screen. The backlight brightness will be one of the 6 levels set by tapping on the backlight icon at the bottom of the screen. Select the *Minimum* level for minimum brightness and (power consumption), and *Maximum* level for maximum brightness and (power consumption). Once you have chosen the level, select *Close* to save the settings.

When the instrument has been left unused for the time specified in the *Turn off Backlight* parameter, the backlight level will change to the dim level (*Minimum*). This state will hold for the time specified in the *Turn off Backlight Dim* parameter (if still left unused). If the instrument has been left unused for the time specified in the *Turn off Backlight* parameter, plus the *Turn off Backlight Dim* time period, then the backlight will be switched off completely (see Fig. 8.4). Use the keyboard or tap on the screen to switch the backlight on again.

Fig. 8.4
Power Settings overview



If the instrument is left unused, not measuring and not communicating over the USB interface, it will go to standby after the time specified in the *Standby* parameter. If in standby mode, you have to press the power-on pushbutton ⏻ to switch the instrument on again.

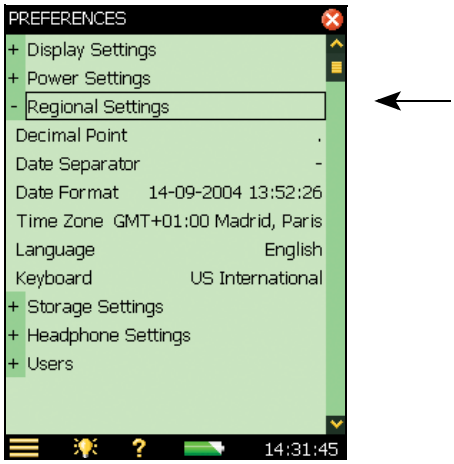
Note: If the instrument is externally powered, then the settings of the *Backlight* and the *Standby After* parameters are ignored. The backlight, in this case, is always on. It will never dim and the instrument will never go to standby.

When you have made your choices, tap on *Power Settings*, or on the minus icon -, to collapse the list.

Regional Settings

Tap on *Regional Settings*, or select the plus icon + next to *Regional Settings*, to expand the list of available regional settings, see Fig. 8.5.

Fig. 8.5
Regional Settings screen



Select your preferred settings for *Decimal Point* and *Date Separator* and select your preferred date/time format from the six different formats provided in the drop-down. Then select your time zone from the list.

A selection of common languages have been provided with the user interface of Type 2250. Select the one you prefer to change it immediately.

Built-in help is provided in the more commonly used languages – if your particular language is not covered, English will be chosen automatically.

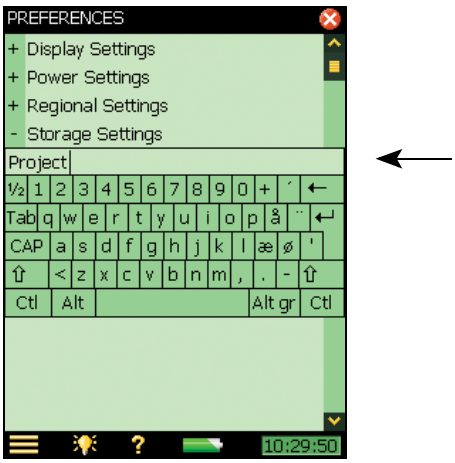
Select a keyboard matching the one you prefer when using your PC.

When you have made your choices, tap on *Regional Settings*, or on the minus icon -, to collapse the list.

Storage Settings

Each time you save the results of a measurement, Type 2250 suggests a project name and number for the project. You can specify a *Project Name Prefix* (max. 8 characters), using the standard full character keyboard that pops up when you tap on the current name set as the project name prefix, see Fig. 8.6. (The field where you type in the project name prefix will appear at the top or bottom of the pop-up keyboard, depending on how many settings you have expanded in the list.) The project suffix number will be generated automatically.

Fig. 8.6
Storage Settings screen



Headphone Settings

The headphone settings allow you to control the output to the headphone socket on the connector panel (see item 2 in Fig. 2.2).

Commentary annotations on measurements can always be heard on the headphones, regardless of the options chosen in *Headphone Settings*.

In addition to the commentary annotations, you can listen to the measured signal for monitoring purposes. Select between A-weighted, C-weighted or Z-weighted.

The measured signal covers approx. 120 dB (from approx. 20 dB to 140 dB with a Type 4189 microphone of nominal sensitivity). The output of the headphone socket covers approx. 75 dB. Use the gain settings for the measured signal to adjust the output level to suit the listening conditions. If the signal has a very high dynamic range (or the levels are unknown), you can set *Automatic Gain Control* to *On* – this will convert the 120 dB input range to 40 dB output range enabling you to hear signals of any level clearly.

Individual gain settings are provided for the commentary annotations and the measured signal. Tap on the gain parameter and use the keypad to enter a new setting. Use '@' to assign the new value for immediate response at the output – or use the up/down navigation keys to increment/decrement the value.

Note 1: A 0 dB gain on the measurement signal means you get a 1 V output for a 1 V input (when the measured signal *Automatic Gain Control* is set to *Off*).

Note 2: While playing back an annotation, you can use the up/down navigation keys to increase/decrease the gain of the annotation.

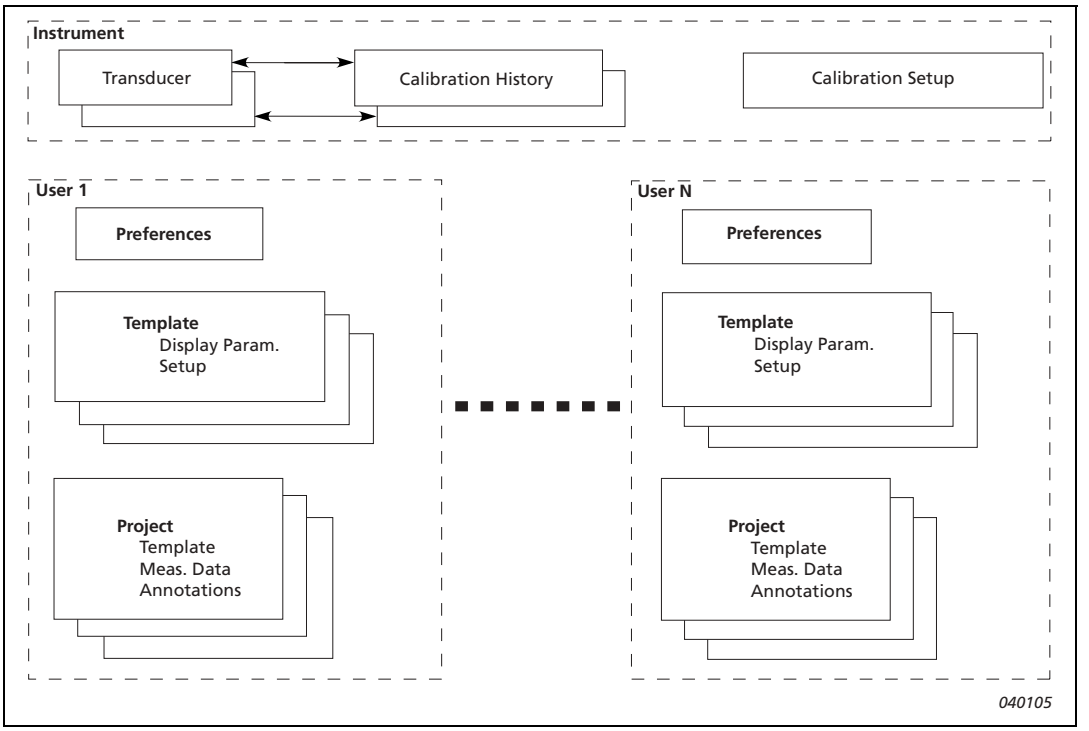
Note 3: If you do not want to listen to the input signal, then set the *Listen to Signal* parameter to *No*, to economise on power.

Multi-user Facility

Type 2250 can handle more than one user of the instrument. Each user can have their own set of preferences, templates and jobs and projects – completely invisible to other users. This can also be very useful in organising large measurement jobs, or cases – you can separate the cases completely from each other by handling each case as a separate user.

The transducers, the calibration setup and the calibration histories of the transducers are common to all users, as shown in the overview provided in Fig. 8.7

Fig. 8.7 *Overview of Multi-user Facility*



Tap on *Users*, or the plus icon +, then select *Yes* in the *Multi User Enabled* drop-down to distinguish between different users.

The instrument, when delivered, has one default user called '2250'.

You require Utility software for Hand-held Analyzers BZ 5503 (included with Type 2250) to set up new users on the instrument, see "Transferring Measurement Data to Your PC" on page 49.

Printer Settings

You can make screen dumps on a printer connected to Type 2250 using USB cable AO 0657. Use the Printer Settings to select your preferred printer.

When a printer has been selected under the *Printer Used* parameter, then the **Print Screen** command in the Main Menu appears. Use this command to print a screen dump of any screen on Type 2250.

The printer must either be an MPS type, or accept the PCL® printer language (PCL: Printer Control Language developed by Hewlett-Packard – see details on their website: www.hp.com):

- *MPS*: Mobile Pro Spectrum thermal printer from AM-TECH, see details on website: www.amteq.co.kr
- *PCL*: printers accepting PCL printer language
- *PCL Inkjet*: suitable for Inkjet printers and supports colour printing
- *PCL Laser*: suitable for Laser printers

For the PCL printers you can use the *Top* and *Left Margin* parameters to position the print on the paper, and use *Width* and *Height* parameters to set the size of the print.

Modem Settings

You can use Type 2250 for monitoring in remote places and control it using Utility Software for Hand-held Analyzers BZ 5503 via a telephone connection – wired or wireless – using suitable modems. When you connect via modem you will see the contents of Type 2250 in the Instrument Task, as if you had made the connection via USB. You then have the same possibilities for transferring data to the Archive and organising data on Type 2250, as if you were connected via the USB connector. Please refer to the on-line manual of BZ 5503 for details of how to make a connection and dial-up.

Hayes compatible modems (GSM or standard analogue modems) are supported. The modem connected to Type 2250 should either be a Compact Flash modem, or a modem with an RS-232 serial interface, to be connected via a Compact Flash to Serial converter.

To use the modem you only need to set the *Modem* parameter to *Enabled* in the *Modem Settings*. No other settings are necessary.

Note: Before you connect or disconnect a modem (or switch it on or off), the *Modem* parameter should be set to *Disabled*, or Type 2250 must be in standby mode or switched completely off – the latter is recommended.

Compact Flash Modems

Compact flash modems can be inserted directly in the compact flash socket of Type 2250 (see item 9 in Fig. 2.2).

Analogue Modems

The following modems have been tested:

- CF 56 K Modem Card from Socket – see details on website: www.socketcom.com
- 56 K CompactModem from Pretec – see details on website: www.pretec.com

GSM Modems

The following modems have been tested:

- CONNECT2AIR GPRS Compact Flash Card from Fujitsu-Siemens – see details on website: www.fujitsu-siemens.com
- CompactGPRS from Pretec – see details on website: www.pretec.com

Note: The SIM card should be usable without pin-code.

Modems with RS-232 Serial interfaces

Modems with an RS-232 serial interface can be connected using a Compact Flash to Serial converter inserted in the compact flash slot of Type 2250. The following Compact Flash to Serial converter has been tested:

- Serial I/O CF Card – Ruggedized, from Socket – see details on website: www.socketcom.com

Analogue Modems

The following modem has been tested:

- MT5600ZDXe from MultiTech Systems (Brüel & Kjær order number: ZM 0069) – see details on website: www.multitech.com

GSM Modems

The following modems have been tested:

- GSM Module M1 from Siemens
- WMOD2B-G900/1800 Dual Band Modem from Wavecom (Brüel & Kjær order number: WQ 1238) – see details on website: www.wavecom.com

Note: The SIM card should be usable without pin-code.

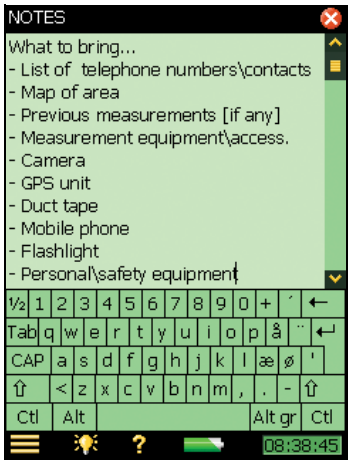
Preparing your Measurements

You can prepare your measurements in advance by making job folders, setting up the correct measurement parameters in the templates, and by making checklists (see example in Fig. 8.8) either as memos containing addresses and phone numbers of relevant people, or notes that have been partly filled-in beforehand, where you just have to fill in the final information on location. The notes can be attached to jobs as annotations, and can be copied onto projects, when necessary.

When you have finished typing in your note, tap on the  icon to accept the changes and save it as a text annotation. See “Document your Measurement” on page 20 for more details on annotations.

The job folders, templates and notes can be made in advance on the PC using the Utility software for Hand-held Analyzers BZ 5503. The notes can be made as txt files using a standard notepad editor, however, save the text in Unicode or UTF-8 format, if the text contains non-ASCII characters.

Fig. 8.8
Example notes screen



Chapter 9

Installing, Updating and Upgrading Applications

How to Install New Applications

2250 Sound Level Meter Software BZ 7222, 2250 Frequency Analysis Software BZ 7223, 2250 Logging Software BZ 7224 and 2250 Sound Recording Option BZ 7226 are pre-installed on Type 2250. However, a valid license is required to run the software. If you have purchased Type 2250 together with the software application(s), then the relevant license(s) will come pre-installed on the instrument.

If you purchase a separate software application for your Type 2250, then you have to install the license on the instrument. This is done using Utility Software for Hand-held Analyzers, BZ 5503, please consult the on-line help included with the BZ 5503 software for instructions on how to install a license.

Tap on the Help icon ? on the instrument's screen, then select **About** to get a list of installed software and licenses.

How to Update/Upgrade Applications

When new versions of Type 2250 software become available, you may want to install the software on your instrument. This is done using the Utility Software for Hand-held Analyzers, BZ 5503. Some software versions will be free updates, and some will be upgrades requiring that a new license is purchased. The BZ 5503 software will clearly indicate if the new software version is an update (free of charge) or an upgrade (license fee). Please consult the on-line help included with the BZ 5503 software for instructions on how to install upgrades/updates of the software.

Tap on the Help icon ? on the instrument's screen, then select **About** to get a list of installed software and licenses.

How to Move a License

If you have more than one Type 2250, you may want to share application software between the instruments. You can do this by moving the license from one Type 2250 to another by using Utility Software for Hand-held Analyzers BZ 5503, together with the License Mover VP 0647.

If you lend out your Type 2250, you may want to temporarily 'un-install' applications not needed. This can be achieved by moving the license of the application to License Mover VP 0647. When needed again, you move the license back to your Type 2250.

Please consult the on-line help included with the BZ 5503 software for instructions on how to move a license.

Troubleshooting

Type 2250 Measurements

If your Type 2250 measurement seems to be wrong, then:

- Check the cabling, if any
- Check that the microphone, including preamplifier, is correctly mounted in the top socket (or correctly connected to the extension cable)
- Check that the *Input* parameter is set to *Top Socket*/*Rear Socket* in agreement with how you are going to use the input. This is found by tapping the Main Menu icon, then **Setup,** followed by *Input*
- Check that the transducer you have mounted on your Type 2250 is selected as the *Transducer Used* parameter, this is also found in the **Setup** menu
- Check whether the parameters for the selected transducer (*Transducer Used*) are set correctly, especially the *Microphone Type* and *Polarization Voltage* parameters. These are found by tapping the Main Menu icon, then **Transducers**
- Check that the *Sound Field* and *Windscreen Correction* parameters have been set correctly. These are found by tapping the Main Menu icon, then **Setup,** followed by *Input*
- Check if the calibration is OK (make a new calibration using an external calibrator)

SD and CF Cards

The Logging and Sound Recording software requires that measurements are saved on SD or CF memory cards. If you experience problems in storing or recalling data on memory cards, you can check and repair the integrity of the file system on the memory card or even re-format it, by doing the following:

1) Insert the memory card in the correct slot of the connector panel of Type 2250, see Fig. 2.2.
2) Tap the Main Menu icon and then **Explorer**.
3) Tap on the icon to go up folder levels until you have reached the topmost level with a list of the available memory devices.

4) Tap on the name of the memory card (not the icon) to get a list of available commands.

5) Select **Check and Repair** to start the procedure. If any errors are found in the file system, they are fixed. When finished, you will be informed whether the memory device was OK or that errors have been fixed.

   Note: the checking procedure can take several minutes, depending on the size of the memory card.

Formatting a memory card:

1) Select **Format** to start the formatting procedure.

⚠ **WARNING:** All data on the memory card will be erased during the formatting process.

Note: the formatting procedure can take several minutes – depending on the size of the memory card.

⚠ **WARNING:** Do not remove the memory card or switch off the instrument during the procedure – this might damage the file system and data and make the card unusable.

Battery Pack and Recalibration of Battery Charge Indicator

The software keeps the capacity of the battery pack updated. Over time the total capacity of the battery pack decreases. If you find that the 'Time Remaining' estimate (tap on the battery icon  to get this information) does not match the real time remaining (e.g., the instrument switches off automatically because of lack of power while the Time Remaining estimate indicates at least ½ hour), then you should manually re-calibrate the capacity of the battery pack. This is done using the following method:

- Drain all the power from the battery:
  - Switch the instrument on
  - Disconnect external power
  - Disconnect the instrument from the PC
  - In the **Preferences** menu, under *Power Settings*, set *Standby After* to *Never*
  - You may want to set *Backlight On* to *Always* (in the same menu) and select the maximum level of display backlight in order to drain the battery faster (use the Backlight icon  at the bottom of the screen)
  - Leave the instrument until the battery voltage becomes so low that the instrument switches itself off
- Charge the battery fully (at least 10 hours):
  - Connect the Mains Power Supply ZG 0426 to the instrument
  - Switch the instrument on (and leave it on) and remember to reset the *Standby After* and *Backlight On* to your preferred settings
  - Let the battery charge until the battery charge indicator just below the power socket starts flashing

Touch Screen

If tapping with the stylus on the screen seems to be getting more inaccurate, you can adjust the touch sensitive screen, as follows:

- In the **Preferences** menu, under *Display Settings* activate the link *Adjust Touch Screen*. This displays a full screen with guidance on how to tap on a cross five times at different places on the screen. The adjustment procedure ends with saving the values or canceling the adjustment.

Reset Options

Reset Button

If your Type 2250 stops responding to pushbutton presses, or stylus taps, then you can do the following:

- Reset and reboot the instrument by pressing the reset button (located on the connector panel – see Fig. 2.2 in Chapter 2) with the point of the stylus.

⚠ **WARNING:** Unsaved data or setups will be lost when you reset the instrument.

Instrument Reset

If you still experience problems, then you can

- Reset the instrument to a default state, where the user is set to '2250', the project template is set to **SOUND LEVEL METER** and *No Transducer* selected. The existing **SOUND LEVEL METER** project template will be overwritten, as will the preferences for user '2250'. To reset the instrument to the default state, do as follows:
  - Power off the instrument (press and hold the power-on pushbutton for at least 5 seconds)
  - Press and hold down the **Commentary** and **Save** pushbuttons while switching on the instrument. The display will show:

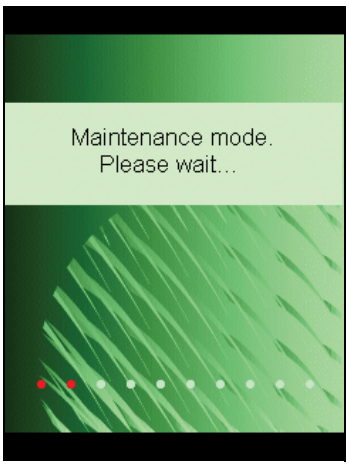
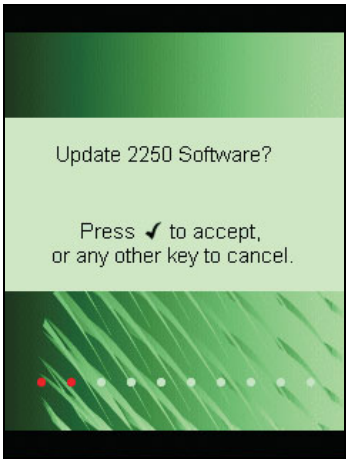


Fig. 9.1
Maintenance Mode – initial screen

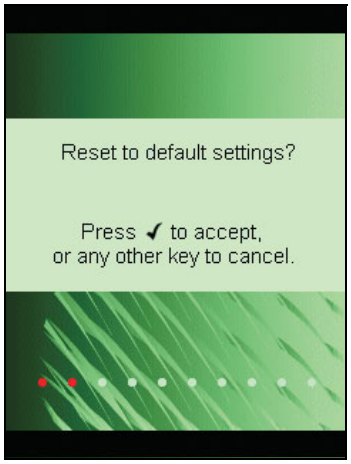
Within a few seconds the display will show:

Fig. 9.2
Update 2250 software screen



Press any other pushbutton than the **Accept** pushbutton ✓ to continue:

Fig. 9.3
Reset to default settings screen



Press the **Accept** pushbutton ✓ to reset to default settings.

If the instrument now functions normally, you should select the correct transducer again in the **Transducers** menu, make your preferred settings in the **Preferences** menu, adjust the touch screen again and make necessary changes to **Setup** (all accessed via the Main Menu ☰).

If you experience problems selecting the correct transducer again, or selecting another template or you login as another user, then note which step causes the problem. You might need to delete a transducer, or delete/reconfigure templates or users.

WARNING: If you delete a transducer, the calibration history will be lost.

You can delete a transducer from the transducer database by pressing the Delete Transducer icon (see "Transducer Database" on page 40).

To delete/reconfigure templates or users you can use Utility Software for Hand-held Analyzers BZ 5503, with the instrument connected to the PC using the USB interface cable (AO 1476) or a modem connection. Please consult the on-line help included with the BZ 5503 software for instructions on how to configure Type 2250.

Re-installing Software

If the instrument still does not work normally after performing the 'Reset to Default Settings' procedure, then the software might need to be re-installed. This can be done in two ways:

1) If the connection to Utility Software for Hand-held Analyzers BZ 5503 works with the instrument connected to the PC using a USB cable, then the software can be re-installed and re-configured through the USB cable. Please consult the on-line help included with the BZ 5503 software for instructions on how to re-install software on Type 2250.

2) If the connection to the PC does not work, then you need a Compact Flash card (size at least 64 Mbytes) and a Compact Flash card reader for the PC. You can then use Utility Software for Hand-held Analyzers BZ 5503 to update the Compact Flash card with the necessary files. Please consult the on-line help included with the BZ 5503 software for instructions on how to update a Compact Flash card with installation files for Type 2250.

   Power off Type 2250 and insert the compact flash card in the CF slot on the instrument. Then press and hold down the **Commentary** and **Save** pushbuttons while switching on the instrument. The Maintenance Mode initial screen will be displayed, and then within a few seconds the screen shown in Fig. 9.2 will appear.

   Press the **Accept** pushbutton to update the software. This will take approx. 5 minutes.

   WARNING: Do not remove the CF-card while updating the Type 2250 software!

   When the Type 2250 software has been updated, you will get the option of resetting to the default settings.

If the problem still persists, then you should contact your local Brüel & Kjær representative.

Service and Repair

Type 2250 is designed and constructed to provide many years of reliable operation. However, if a fault occurs that impairs the sound level meter's correct function, then remove the battery pack and disconnect any external power supply to prevent risk of further damage.

For more information about preventing faults or damage to your sound level meter, please read the "Care, Cleaning and Storage" section that follows.

For repair, contact your local Brüel & Kjær representative. Brüel & Kjær provides a high level of support and after-sales service to assist customers in the handling and operation of their instruments.

Care, Cleaning and Storage

Type 2250 is a delicate precision instrument. When handling, storing or cleaning your instrument, please take the following precautions.

Handling the Instrument

- Do not try to remove the microphone grid as you can easily damage the microphone in this way
- Do not attempt to open the instrument. There are no user-serviceable parts inside. If you think your instrument requires service, please contact your Brüel & Kjær representative
- Do not allow the instrument to get wet
- Protect the instrument from impact. Do not drop it. Transport it in the supplied carrying pouch

Cleaning the Instrument

If the instrument casing becomes dirty, then wipe it with a lightly dampened cloth. Do not use abrasive cleansers or solvents. Do not allow moisture to enter the microphone, connectors or casing.

Storing the Instrument

- Keep the sound level meter in a dry place, preferably within its carrying pouch
- For long-term storage, remove the battery pack
- Do not exceed storage temperature limits of –25 to +70°C (–13 to +158°F)

Chapter 10

1/1- or 1/3-octave Frequency Analysis (Optional Module)

2250 Frequency Analysis Software BZ 7223 enables you to make 1/1-octave or 1/3-octave measurements and broadband sound level measurements simultaneously.

Check the About Menu to see whether you have the right license to run the frequency analyzer. The About Menu is accessed from the built-in help – tap ? on the shortcut bar, then select **About**. See Chapter 9 for instructions on installing the license for the frequency analyzer.

Setting up the Instrument

The frequency analyzer measures the following spectra parameters during timed measurement:

- L_{Xeq}
- L_{XFmax}
- L_{XSmax}
- L_{XFmin}
- L_{XSmin}

where X is the frequency weighting A, C or Z.

These spectra are saved in the project together with the measured sound level meter (broadband) parameters.

In addition, the instantaneous spectra L_{XF} and L_{XS} are always available.

1) Select the **FREQUENCY ANALYZER** Project Template. (See “What is a Project Template?” on page 14 for more details on templates.) The Project Template is displayed at the top of the screen, if it does not display **FREQUENCY ANALYZER**, tap on the black bar at the top of the screen and select **FREQUENCY ANALYZER** from the drop-down that appears.

2) Tap the Main Menu icon ☰ and select **Setup** from the list of options. Set the *Broadband* and *Spectrum* parameter to A, C or Z, as required.

Then, under *Bandwidth*, set the *Bandwidth* parameter to 1/1-octave or 1/3-octave before making the measurement.

To exit the screen, tap on the icon.

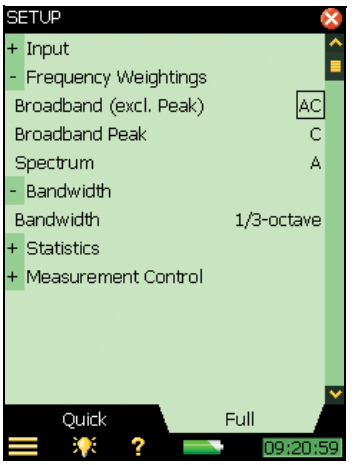


Fig. 10.1
Setting the frequency weighting and bandwidth parameters

Controlling the Measurement

The measurement is controlled in the same way you would control a normal sound level meter measurement, using **Start/Pause**, **Continue**, **Back-erase** and **Reset** pushbuttons, see Chapter 3 for more details.

Displaying the Results

The frequency analyzer measurement screen includes three tabs at the bottom: *Spectrum*, *Broadband* and *XL View* (Extra Large View). The tabs allow you to choose different ways of displaying the measurement results. All but the *Spectrum* tab have been covered previously in Chapter 3, however, a quick recap is provided below.

The *Broadband* view shows an instantaneous L_{AF} readout, with associated bar graph and four measurement parameters, followed by two measurement setup parameters. (The first measurement parameter is displayed in a larger font size for better readability.)

The *XL View* increases the size of the first parameter readout to a 4 digit, full-screen display (including decimal point).

The *Spectrum* view, (which only appears as a tab if Frequency Analysis Software BZ 7223 is enabled), shows two different spectra parameters being measured simultaneously. In the example in Fig. 10.2, L_{ZFmax} and L_{ZF} are being viewed at the same time.

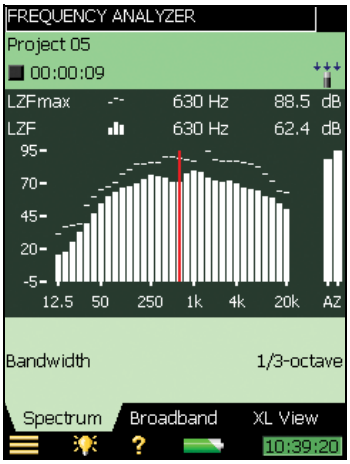
Note the and icons, indicating which spectrum belongs to which parameter.

1) Select which spectra to view by tapping the parameter fields in the two lines above the spectrum display.

   These lines also include readouts of the spectrum values highlighted by the spectrum cursor. Tap on the spectrum at the frequency of interest - or just tap anywhere in the spectrum area and then move the cursor to the position of interest using the left ◄ and right ► arrow pushbuttons.

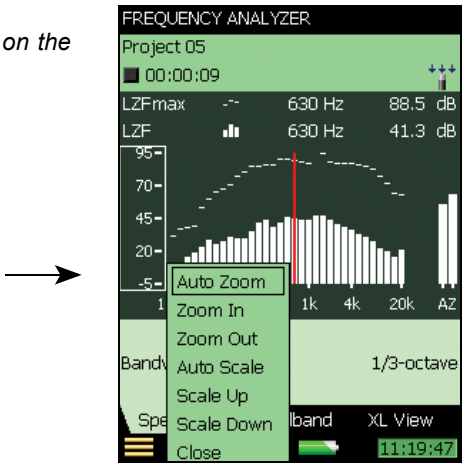
   To the right of the spectrum, two broadband bars (of the same parameters) are also displayed.

Fig. 10.2
Displaying the results – spectrum screen



2) Scale the Y-axis (left-hand vertical scale of the graphical display) by tapping on the scale and accessing the drop-down menu, see Fig. 10.3. (You can also select the spectrum cursor and press the **Accept** ✓ pushbutton.)

Fig. 10.3
Scaling the Y-axis on the Spectrum display



Select *Auto Zoom* to adjust the range of the Y-axis for best fit of the measured spectrum.

Select *Zoom In*/*Zoom Out* to adjust the zoom.

Select *Scale Up/Scale Down* to adjust the full scale value on the Y-axis – or select *Auto Scale* to select the best scaling for viewing the spectra – without adjusting the zoom.

Auto Zoom and *Auto Scale* automatically close the drop-down menu, otherwise, select *Close,* tap outside the dropdown list or use the left arrow ◄ pushbutton to close the menu.

Hint: a quick way of auto zooming is to tap anywhere in the spectrum and then press the **Accept** ✓ pushbutton twice.

Saving Results

Measurements are saved and can be viewed later, in the same way as described for the Sound Level Meter Project in Chapter 3.

Chapter 11

Logging (Optional Module)

2250 Logging Software BZ 7224 enables you to measure and save data periodically on SD- or CF-Cards. The module is optimised for attended use, which means that while measuring you can annotate any sound on-line, as well as 'mark' up to five different sound categories on-line.

The main benefit is that data is documented on-site and is therefore ready for post-processing and reporting back at the office using Utility Software for Hand-held Analyzers BZ 5503 or other post-processing software such as Noise Explorer Type 7815, Evaluator Type 7820, Protector Type 7825 or Microsoft® Excel.

In addition to measuring broadband parameters (see Chapter 3) and spectra[a] (see Chapter 10), the logging module allows you to simultaneously log the following parameters:

- Broadband Parameters (including broadband statistics)
- Spectra[a]
- Broadband Parameters every 100 ms
- Record the measured signal[b]

Check the **About** Menu to see whether you have the right license to run the Logging module. (The **About** Menu is accessed from built-in help – tap ? on the shortcut bar, then select **About**.) See Chapter 9 for instructions on installing the license for the Logging Module.

Setting up the Instrument

1) Select the **LOGGING** Project Template. (See "What is a Project Template?" on page 14 for more details on templates.) The Project Template is displayed on the black banner at the top of the screen. If this banner does not display **LOGGING**, tap on the banner and select **LOGGING** from the drop-down that appears.

   Note: The Logging Project Template assumes you have a license for the Frequency Analysis Software. If not, then select the **LOGGING SLM** Project template instead.

a. Requires Frequency Analysis Software BZ 7223
b. Requires Sound Recording Software BZ 7226

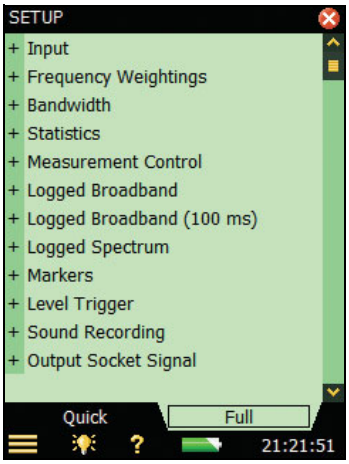
2) Insert the supplied SD Card UL 1009 in the slot for SD Cards (see item 10 in Fig. 2.2). You will be notified that an SD Card has been inserted – select *Yes* to change the default measurement path to the SD Card.

3) Tap the Main Menu icon and select **Explorer** from the list of options. Navigate to the SD-Card, create a job folder for the measurements and set the default measurement job/ path as described in Chapter 6.

   Note: You cannot log data on the internal disk.

4) Tap the Main Menu icon and select **Setup** from the list of options. The Setup screen will appear, see Fig. 11.1. Set the *Input*, *Frequency Weightings*, *Bandwidth*[a] and *Statistics* parameters as required for the Sound Level Meter and Frequency Analyzer[1] measurement, see Chapter 3 and Chapter 10 respectively. These settings are common to both the logging and the total measurement.

Fig. 11.1
The Setup screen



5) Under the *Measurement Control* parameters, set the *Measurement Time* and *Logging Period* as required. Set *Synchronize with clock* to *Yes* if you want the logging to synchronise with whole minutes or hours. For example, if *Logging Period* is set to 1 minute and you start the measurement at 8:12:33, then the first logging interval will be from 8:12:33 to 8:12:59 (27 seconds), the second will be from 8:13:00 to 8:13:59 (60 seconds), etc. Set *Synchronize with clock* to *No* if you want every logging interval to be the specified Logging Period exactly.

6) Under the *Logged Broadband* parameters, choose which broadband parameters you want to log in accordance with the *Measurement Control* parameters. You can choose to log *Full Statistics* per *Logging Period* or not. You can also choose to log *all* the measured *Broadband Parameters* or a *Selected* number of parameters. If you choose *Selected* then you can specify up to 10 parameters.

a. Requires Frequency Analysis Software BZ 7223

7) The *Logged Broadband (100 ms)* parameter allows you to log L_{Aeq} (with an elapsed time of 100 ms and a logging period of 100 ms) and/or L_{AF} (with a logging period of 100 ms) irrespective of the other logging parameters.

8) The *Logged Spectrum*[a] parameter allows you to choose which spectra to log. You can specify to log *All*, *None* or up to 3 *Selected* spectra.

9) Under *Markers* you can specify the names of the five available markers. The markers are predefined as follows:

   - Marker 1: 'Exclude' – can be controlled by pressing the **Back-erase** pushbutton
   - Marker 2: 'Manual' – can be controlled by pressing the **Manual Event** pushbutton
   - Marker 3: 'Level' – can be controlled by the Level Trigger detection
   - Marker 4: 'Marker 4'
   - Marker 5: 'Marker 5'
   - Marker 6: 'Sound' – is set when recording sound (requires Sound Recording Software BZ 7226)

   All markers can be controlled by the stylus in the Profile display.

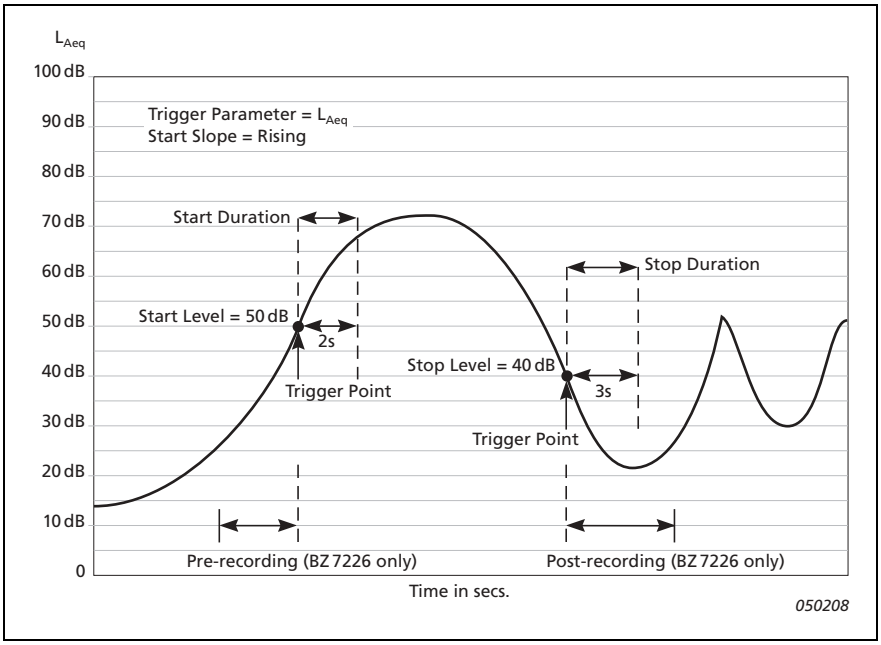
   You can set a *Pre-marker Time* between 0 and 5 seconds. This will start markers 1, 2 or 3 the set number of pre-marker seconds before the point where the **Back-erase** pushbutton, the **Manual Event** pushbutton, or the Level Trigger, respectively, are pressed. See "Marking Sound Categories" on page 80.

10) Under the *Level Trigger* parameters, choose the settings for triggering the number 3 marker 'Level' and for starting a sound recording – see Chapter 12.

   - Set *Level Trigger Control* to *On* to enable the level trigger facility, or *Off* to disable the facility
   - Set *Trigger Parameter* to the parameter you want to monitor, e.g., L_{Aeq} – see Appendix A for the total list of parameters
   - Set *Start Slope* to *Rising* if you want to start when the *Trigger Parameter* exceeds *Start Level* (and stop when it goes below *Stop Level*) or to *Falling* if you want to start when the *Trigger Parameter* goes below *Start Level* (and stop when it exceeds *Stop Level*)
   - Set *Start Duration* for the number of seconds the *Trigger Parameter* must fulfill the trigger condition before the trigger point is acknowledged
   - Set *Stop Duration* for the number of seconds the *Trigger Parameter* doesn't fulfill the trigger condition anymore to acknowledge the end point of the trigger. (See the relationship between the trigger parameters in Fig. 11.2)

a. Requires Frequency Analysis Software BZ 7223

Fig. 11.2 *Relationship between trigger parameters*



11) Under the *Sound Recording* parameters, choose the settings for recording sound while making a logging – see Chapter 12.

12) Under *Input* specify *Trigger Input* if you want to start the sound recording using an external trigger signal. See details in Appendix A.

To exit the screen, tap on the  icon.

Controlling the Measurement

The measurement is controlled in the same way you would control a normal sound level meter measurement, using **Start/Pause**, **Continue**, **Reset** and **Save** pushbuttons, see Chapter 3 for more details.

Annotating a Project

While using the logging software you can annotate measurements using the normal method of adding annotations to a project, before or after a measurement, or while the measurement is paused. The annotations can then be viewed by tapping on the paperclip icon or tapping the Main Menu and selecting **Explorer** from the list of options. See “Document your Measurement” on page 20.

However, if you choose to annotate the profile during the measurement, the annotation icon will appear below the profile, not as a paperclip icon in the status field or attached to a project in **Explorer**, as described previously. In this case, you view the annotation using the method described under "The Profile" on page 79.

Recording Sound

You can record sound during the measurement[a] by pressing the **Manual Event** pushbutton (Manual Event marker), the **Back-erase** pushbutton (Exclude Marker) or when the level of a specific parameter exceeds a certain level – or you can record sound through the whole measurement – depending on the Sound Recording setting in the Setup – see details in Chapter 12.

Displaying the Results

The Logging measurement screen (or Profile View) includes three tabs at the bottom: *Profile*, *Spectrum* and *Broadband* View (the Logging SLM includes the tabs: *Profile*, *Broadband* and *XL View*). The tabs allow you to choose different ways of displaying the measurement results. All but the *Profile* tab have been covered previously in Chapters 3 and 10, however a quick recap is provided below.

The *Broadband* view shows an instantaneous L_{AF} readout, with associated bar graph and a number of measurement parameters. (The first measurement parameter is displayed in a larger font size for better readability.)

The *XL View* increases the size of the first parameter readout to a 4 digit, full-screen display (including decimal point).

The *Spectrum* view shows two different spectra parameters being measured simultaneously.

The Profile View

The *Profile* view displays a profile of a logged broadband parameter (dB versus time). This is very convenient when marking sound categories on-line or annotating the measurement. See Fig. 11.3.

a. Requires License for Sound Recording Software BZ 7226

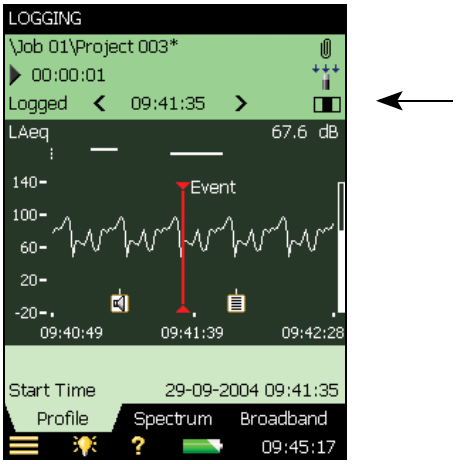


Fig. 11.3
Profile View (showing extended status field)

Status Field

The Status Field has been extended to include an extra line of information below the two existing lines of information covered previously in the Sound Level Meter and Frequency Analyzer (see Fig. 11.3).

This extra line of information allows you to:

- Select whether the results of the *Total* measurement from the *Logged* measurement, or from the *Logged(100 ms)* measurement are displayed. Select *Total* to display the measurement parameters of the Total measurement in all the views – the Broadband and Spectrum views will then display parameters or spectra similar to the Sound Level Meter or Frequency Analyzer. (The Profile View will be empty, because the Total measurement contains only a single set of parameters). Select *Logged* to display the measurement parameters from the logging intervals. The cursor in the profile selects which logging interval is displayed in all the views. Select *Logged(100 ms)* to display the L_{Aeq} or L_{AF} in the profile from the 100 ms logging intervals. This setting does not display spectra or parameters in other views
- View the start time of the measurement (for *Total*) or the start time of the current logging interval (for *Logged* or *Logged(100 ms)* if measuring and the profile is not frozen) or the start time of the logging interval pointed out by the cursor. Tap on the start time in any of the views to select data from another logging interval
- View whether the display of the profile during the measurement is frozen or not. When the icon is "animated" the display is being updated with new logged data during the measurement. You can freeze the display update by tapping on the icon. This also freezes the icon. Tap on the icon again to unfreeze the display
- Step forwards or backwards through the logging intervals on all displays, using the and icons. (The icons are also connected to the profile cursor, so that any corresponding movement backwards or forwards through the intervals in one display will be reproduced in the other)

Some interaction with the display will automatically freeze and unfreeze the display (only while measuring):

- Tap the stylus on the profile. This will set the profile cursor and freeze the display update of the profile. You can move the cursor to any point in the profile by using the left and right arrow pushbuttons. The profile will be scrolled automatically, if necessary. Unfreeze by tapping on the icon
- Tap and hold the stylus on the profile display and drag it to the left or right. This will freeze the display and show two cursors. Next, remove the stylus from the display and a dropdown menu appears with the possibility of setting or editing a marker or annotation (see below). Select the required function from the dropdown menu. When the function has been carried out, the profile unfreezes automatically and progresses as it did before you tapped on the screen

The Profile

Select which parameter to view by tapping the parameter field in the line above the profile.

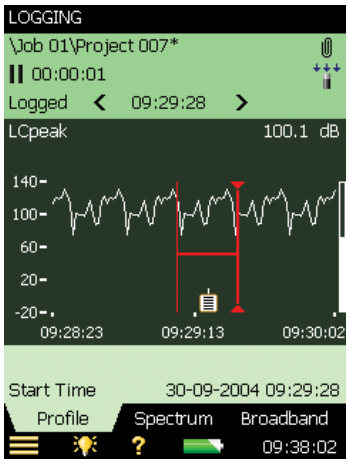
Markers are displayed between the profile and the profile parameter. Marker 1 (Exclude) is the topmost positioned marker. The name of the marker is displayed if the marker overlaps the cursor position. If a sound has been recorded, then a Sound Marker (Marker 6) is displayed above the profile – the marker covers exactly the time of the sound recording.

The whole, or any part of the sound recording can be played back, once or repetitively – see Chapter 12 for details.

To the right of the profile, the broadband parameter L_{AF} is displayed and updated regardless of the measurement status and the display freeze status.

Annotations are displayed below the profile as icons. To select an annotation, tap and hold the stylus at one side of the icon, just above it, then drag the stylus to the opposite side of the icon (so it looks like the example in Fig. 11.4) and remove the stylus from the display.

Fig. 11.4
Selecting Annotations



A dropdown menu appears, select the required function:

- Open note or play commentary
- Delete annotation

- Move annotation (to the position on the display where the stylus was removed from the display)

Scale the Y-axis (left-hand vertical scale of the graphical display) by tapping on the scale and accessing the drop-down menu (as in the Spectrum display):

- Select *Auto Zoom* to adjust the range of the Y-axis for best fit of the measured spectrum
- Select *Zoom In/Zoom Out* to adjust the zoom
- Select *Scale Up/Scale Down* to adjust the full scale value on the Y-axis - or select *Auto Scale* to select the best scaling for viewing the spectra - without adjusting the zoom
- *Auto Zoom* and *Auto Scale* automatically close the drop-down menu, otherwise, select *Close*, tap outside the dropdown list or use the left arrow pushbutton to close the menu

Marking Sound Categories

Use this facility to categorise the sound while you are measuring, or while you are observing the different kinds of sound on the display. This will make it much easier to do the post-processing and reporting back in the office.

You can mark up to five sound categories on-line. The markers are displayed as horizontal lines above the sound profile, see Fig. 11.3. There are two main types of marker:

- An Exclude Marker – this allows you to mark a sound you want to exclude from your measurement later during post-processing or reporting. (It does not remove any data from your measurement)
- An Event Marker – this allows you to mark a particular sound of interest during your measurement

On Type 2250, Marker 1 is used as an Exclude Marker, while Markers 2 to 5 are used as Event Markers. All four event markers can be user-defined. You can define a marker by tapping on the Main Menu icon  and selecting **Setup**, followed by *Markers*.

Marker 2 is set to a Manual Event marker by default – it can be controlled by the **Manual Event** pushbutton and the stylus.

Marker 3 is set to a Level Event marker by default – it can be controlled by the level trigger facility and the stylus.

Marker 6 is used as a Sound Marker and shows the size of the sound recording.

Type 2250 allows you to view the markers at a later date by recalling the data and viewing the desired profile. (This can also be done if you have transferred the data to Type 7815 Noise Explorer).

If required, Type 7820 Evaluator and Type 7825 Protector can use the markers in their calculations. Marker number 1 (the Exclude Marker) will always be used as an Exclude Marker, while markers 2 to 5 will be used as defined in Type 7820 Evaluator/Type 7825 Protector software. The marker names, however, will be transferred from Type 2250. Marker 6 will be used as sound marker.

Marking During the Measurement:

The measurement parameter is displayed as a progressing profile.

Use of pushbuttons:

Press the **Back-erase** pushbutton to start an Exclude Marker (marker number 1). The marker is displayed above the profile. Press the button once more to stop the Exclude Marker.

Press the **Manual Event** pushbutton to start a Manual Event Marker (marker number 2). The marker is displayed above the profile. Press the button once more to stop the Manual Event Marker.

Use of stylus:

Tap and hold the stylus on the profile display at the position where you want the marker to start. This will freeze the display and show a cursor at the position of the stylus. Then drag the stylus left or right to the position where you want the marker to end. This will display a second cursor. Next, remove the stylus from the display and a dropdown menu appears showing the five markers you have specified in the setup. Select the marker you require. The marker is displayed above the profile, the cursors disappear and the profile unfreezes and progresses as it did before you tapped on the screen.

Note: If you select Sound Marker, then the sound for this part will be recorded – see Chapter 12 for details.

Marking Measurement While it is Paused:

The measurement parameter is displayed as a profile while the measurement is paused.

You can use the stylus to mark the sound categories:

Tap and hold the stylus in the profile display at the position where you want the marker to start. This will display a cursor at the position of the stylus. Then drag the stylus left or right to the position where you want the marker to end. This will display a second cursor. Next, remove the stylus from the display and a dropdown menu appears showing the five markers you have specified in the setup. Select the marker you require. The marker is displayed above the profile and the cursors disappear.

Editing Markers on Profiles

To widen a marker:

1) Tap and hold the stylus on the profile display at a position within the marker range.
2) Drag the stylus left or right to the position where you want the marker to end.
3) Remove the stylus from the display and a dropdown menu appears.
4) Select the marker you want to widen from the dropdown menu.

To narrow a marker:

1) Tap and hold the stylus on the profile display at the position inside the marker range where you want it to stop.

2) Drag the stylus left or right to a position outside the marker range.

3) Remove the stylus from the display and a dropdown menu appears.

4) Select *Delete* for the marker you want to narrow from the dropdown menu. The part where the marker overlaps the gap between the two cursors will be deleted.

To delete a marker:

1) Tap and hold the stylus in the profile display at a position to the left of the marker you want to delete.

2) Drag the stylus to a position to the right of the marker.

3) Remove the stylus from the display and a dropdown menu appears.

4) Select *Delete* for the marker you want to delete from the dropdown menu.

   Note: Sound markers cannot be edited. Marking the whole sound marker (or part of it) and selecting *Delete* will delete the whole sound marker and sound recording.

Annotate Sound Categories

You can annotate the measurement on-line with a spoken comment or a written note. The annotation is displayed as an icon below the sound profile.

Annotating During the Measurement:

The measurement parameter is displayed as a progressing profile.

Use of pushbuttons:

Press and hold down the **Commentary** pushbutton and talk to the instrument to make your comment. Release the button when finished. This will insert a comment annotation in the profile at the time when the button was pressed.

Use of stylus:

Tap and hold the stylus in the profile display at the position where you want the annotation to start. This will freeze the display and display a cursor at the position of the stylus. Then drag the stylus a little to the left or right and raise it again. A dropdown menu appears and below the five markers you can select *Add Comment* or *Add Note* to add a spoken comment or write a note. When finished, the Comment or Note is inserted in the profile, the cursors disappear and the profile unfreezes and progresses as before tapping on the screen.

Annotating While the Measurement is Paused:

The measurement parameter is displayed as a profile while the measurement is paused.

Use of stylus to annotate the sound:

Tap and hold the stylus in the profile display at the position where you want the marker to start. This will display a cursor at the position of the stylus. Next, drag the stylus a little to the left or right and remove the stylus from the display. A dropdown menu appears and below the five markers you can select *Add Comment* or *Add Note* to add a spoken comment or write a note. When finished the Comment or Note is inserted in the profile and the cursors disappear.

Use of pushbuttons:

Using the **Commentary** pushbutton during a pause means that the comment annotation will be added to the project instead of the profile. (The annotations can be viewed by tapping on the paperclip icon or tapping the Main Menu and selecting **Explorer** from the list of options. See "Document your Measurement" on page 20.)

Editing Annotations on Profiles

To move an annotation:

1) Tap and hold the stylus on the profile display at a position on one side of the annotation icon.
2) Drag the stylus through the annotation icon to the position where you want the annotation moved to.
3) Remove the stylus from the display and a dropdown menu appears.
4) Select *Move Comment* (or *Move Note*) from the dropdown menu.

To delete an annotation:

1) Tap and hold the stylus on the profile display at a position to the left of the annotation icon you want to delete.
2) Drag the stylus to a position to the right of the annotation.
3) Remove the stylus from the display and a dropdown menu appears.
4) Select *Delete* for the annotation you want to delete from the dropdown menu.

Saving and Recalling Results

Measurements are saved and can be viewed later, in the same way as described for the Sound Level Meter Project in Chapters 3 and 6.

Note: The viewer only displays the Total results. To display the logged data and see or hear annotations – or even edit the markers or insert new markers and annotations – you must Open the saved project instead of Viewing it.

Chapter 12

Sound Recording (Optional Module)

2250 Sound Recording Software BZ 7226 allows you to record sound during measurement using one of the software modules BZ 7222, BZ 7223 or BZ 7224. The sound recording can be controlled manually or by using an external trigger signal. The recording can also be triggered when a measured parameter exceeds a preset level (BZ 7224 only). The recorded sound can be played back and listened to using the supplied earphones, HT 0015. Sound is recorded directly to CF or SD memory cards.

The main benefit is that data is documented on-site and is therefore ready for post-processing and reporting back at the office using Utility Software for Hand-held Analyzers BZ 5503 or other post-processing software such as Noise Explorer Type 7815, Evaluator Type 7820, Protector Type 7825 or Microsoft® Excel.

Check the **About** Menu to see whether you have the right license to run the Sound Recording module. (The **About** Menu is accessed from built-in help – tap ? on the shortcut bar, then select **About**.) See Chapter 9 for instructions on installing the license for the Sound Recording Module.

Sound Level Meter and Frequency Analysis Software

You can use the Sound Recording facility together with the Sound Level Meter Software and the Frequency Analysis Software. You can record the sound for the whole measurement period or you can record sound for controlled parts of the measurement. The recordings are attached to the project as annotations, named “Soundrec N”, where N is the number of the recording for the project. (See “Document your Measurement” on page 20 and “Viewing or Listening to Annotations” on page 46 for a description of how to use annotations.)

Note 1: Sound recordings can only be done during measurements.

Note 2: Sound recordings can only be done on projects saved on SD or CF cards.

Setting up the Instrument

1) Select a Sound Level Meter Project Template or a Frequency Analyzer Project Template. (See “What is a Project Template?” on page 14 for more details on templates.)

2) Insert the supplied SD Card UL 1009 in the slot for SD Cards (see item 10 in Fig. 2.2).

3) Tap the Main Menu icon and select **Explorer** from the list of options. Navigate to the SD Card, create a job folder for the measurements and set the default measurement job/path as described in Chapter 6.

Note: You cannot record sound on the internal disk.

4) Tap the Main Menu icon and select **Setup** from the list of options. Set all the parameters as required for the Sound Level Meter or Frequency Analyzer measurement, see Chapter 3 and Chapter 10 respectively.

5) Under *Sound Recording* you can specify the *Recording Control* parameters as follows:
   - *Automatic*, if you want to start the recording when you start the measurement and stop when you pause the measurement, and to limit the recording to *Maximum Duration*, if *Duration Limit* is set to *On*
   - *Manual Event*, if you want to start and stop the recording using the **Manual Event** pushbutton during the measurement and to limit the duration of the recording, if *Duration Limit* is set to *On*. In this case the recording will be at least *Minimum Duration* long, but no longer than the *Maximum Duration*. Use *Pre-recording Time* and *Post-recording Time* to specify how much extra you want to be recorded before and after the event.
   - *External Event*, if you want to start and stop the recording using an external trigger signal, connected to the Trigger Input. See details in Appendix A.
   - *Off*, if you don't want to record sound

6) Set *Recording Quality* to *High*, *Medium*, *Fair* or *Low* in accordance with your needs. Note, however, that high quality requires more disk space than low quality – see details in Appendix A.

7) Set *Recorded Signal* to either *Input A-weighted*, *Input C-weighted* or *Input Z-weighted*.

   Input C-weighted is suitable for recordings used afterwards to identify the sound source – it contains all the audible content of the signal, but reduces the low-frequency noise from wind, etc.

8) Set *Automatic Gain Control* to *On* – if you don't know the dynamic of the signal beforehand, or the dynamic is very high, then the 120 dB dynamic range (from max. input level and down) will be converted to 40 dB. Otherwise, set it to *Off* and specify the *Peak Recording Level*.

9) Under *Input* you specify *Trigger Input* if you want to start the sound recording using an external trigger signal. See details in Appendix A.

To exit the screen, tap on the icon.

Controlling the Recording

The measurement is controlled in the same way you would control a normal sound level meter measurement, using **Start**/**Pause**, **Continue**, **Reset** and **Save** pushbuttons, see Chapter 3 for more details.

When the measurement signal is being recorded, the recording icon is displayed in the status field. The recording is attached to the project as an annotation. The paperclip icon is then displayed to indicate that the project has been annotated.

When *Recording Control* is set to *Automatic*, the recording will start when the measurement is started and last for the *Maximum Duration* or the *Elapsed Time*, whichever is smallest. If you continue a paused measurement, then a new recording is started.

When *Recording Control* is set to *Manual Event*, the recording will start the first time you press the **Manual Event** pushbutton during the measurement, and stop the second time you press it; if you press it a second time before the *Minimum Duration* has elapsed, then the recording will continue until *Minimum Duration* has elapsed; if you press it a second time after *Maximum Duration* has elapsed, then the recording has already been stopped when *Maximum Duration* elapsed and the pushbutton will initiate a new recording instead.

When *Recording Control* is set to *External Event*, and *Trigger Input* is set to *Voltage Level*, then recording is started when the voltage level is 'high' and stopped when voltage level is 'low' (see details in Appendix A). *Duration Limit* has no effect on this setting.

If *Pre-recording Time* has been set, then the recording will start this time before you hit the **Manual Event** pushbutton. This is possible because the recording is done continuously in an internal buffer, ready to be saved as a wave file. The *Pre-recording Time* is limited by this buffer size and the Recording Quality – see details in appendix A.

Note: Very long sound recordings will be split into wave files containing maximum 10 minutes, i.e., a 35 minute sound recording will consist of 4 wave files, three with 10 minutes sound and one with 5 minutes sound.

Playing the Recording

Sound recordings are attached to the measurement project as annotations. The paperclip icon is displayed in the status field to indicate this. Tap on the paperclip to open the list of annotations. Tap on the annotation to play it back – see details in Chapter 3 and Chapter 6.

Logging Software

You can use the Sound Recording facility together with the Logging Software. You can record the sound for the whole measurement period or you can record sound for controlled parts of the measurement. The recordings are attached to the profile as sound markers. The sound recordings can be controlled by the **Manual Event** pushbutton, the **Back-erase** pushbutton, an external trigger signal, or by the level of the measured signal. You can also control the sound recording using the stylus to mark the interesting part on the profile.

Note 1: Sound recordings can only be done during measurements.

Note 2: Sound recordings can only be done on projects saved on SD or CF cards.

Setting up the Instrument

1) Select a Logging or Logging SLM Project Template. (See "What is a Project Template?" on page 14 for more details on templates.)

2) Insert the supplied SD Card UL 1009 in the slot for SD Cards (see item 10 in Fig. 2.2).

3) Tap the Main Menu icon and select **Explorer** from the list of options. Navigate to the SD Card, create a job folder for the measurements and set the default measurement job/path as described in Chapter 6.

Note: You cannot record sound on the internal disk.

4) Tap the Main Menu icon and select **Setup** from the list of options. Set all the parameters as required for the Logging measurement, see Chapter 11.

5) Under *Sound Recording* you can specify the *Recording Control* parameters as follows:
   - *Automatic*, if you want to start the recording when you start the measurement and stop when you pause the measurement, and to limit the recording to *Maximum Duration*, if *Duration Limit* is set to *On*
   - *Manual Event*, if you want to start and stop the recording using the **Manual Event** pushbutton during the measurement
   - *Exclude Event*, if you want to start and stop the recording using the **Back-erase** pushbutton during the measurement
   - *External Event*, if you want to start and stop the recording using an external trigger signal, connected to the Trigger Input
   - *Level Event*, if you want to start and stop the recording based on the level trigger settings during the measurement
   - *All Events*, if you want to start and stop the recording based on any of the events

     Note: When *Recording Control* set to any of the events, you can limit the duration of the recording, if *Duration Limit* is set to *On*. In this case the recording will be at least *Minimum Duration* long, but no longer than the *Maximum Duration*. Use *Pre-recording Time* and *Post-recording Time* to specify how much extra you want to be recorded before and after the event
   - *Off*, if you don't want to record sound

6) Set *Recording Quality* to *High*, *Medium*, *Fair* or *Low* in accordance with your needs, note, however, that the high quality requires more disk space than low quality – see details in Appendix A.

7) Set *Recorded Signal* to either *Input A-weighted*, *Input C-weighted* or *Input Z-weighted*.

   Input C-weighted is suitable for recordings used afterwards to identify the sound source – it contains all the audible content of the signal, but reduces the low-frequency noise from wind, etc.

8) Set *Automatic Gain Control* to *On* – if you don't know the dynamic of the signal beforehand, or the dynamic is very high, then the 120 dB dynamic range (from max. input level and down) will be converted to 40 dB. Otherwise, set it to *Off* and specify the *Peak Recording Level*.

Under *Input* you specify *Trigger Input* if you want to start the recording using an external trigger signal. See details in Appendix A.

To exit the screen, tap on the  icon.

Controlling the Recording

The measurement is controlled in the same way you would control a normal logging measurement, using **Start/Pause**, **Continue**, **Reset** and **Save** pushbuttons, see Chapter 11 for more details.

When the measurement signal is being recorded, then the recording icon  is displayed in the status field. The recording is attached to the profile as a Marker 6 (Sound).

If you set *Recording Control* to *Automatic*, the recording will start when the measurement is started and last for *Maximum Duration* or *Elapsed Time*, whichever is smallest. If you continue a paused measurement, then a new recording is started.

If you set *Recording Control* to *Manual Event*, the recording will start the first time you press the **Manual Event** pushbutton during the measurement (this starts a Manual Event marker and a Sound marker), and stop the second time you press it; if you press it a second time before *Minimum Duration* has elapsed, then the recording will continue until *Minimum Duration* has elapsed; if you press it a second time after *Maximum Duration* has elapsed, then the recording has already stopped when *Maximum Duration* elapsed, and the pressing the button will have no effect on the sound recording (the Manual Event marker, however, is stopped).

If you set *Recording Control* to *Exclude Event*, the recording will start the first time you press the **Back-Erase** pushbutton during the measurement (this starts an Exclude Event marker and a Sound marker), and stop the second time you press it – the behaviour will be similar to control by the **Manual Event** pushbutton.

When *Recording Control* is set to *External Event*, and *Trigger Input* is set to *Voltage Level*, then recording is started when the voltage level is 'high' and stopped when voltage level is 'low' (see details in Appendix A). *Duration Limit* has no effect on this setting.

If you set *Recording Control* to *Level Event*, the recording will start, controlled by the level trigger – see Chapter 11 for details.

If you set *Recording Control* to *All Events*, the recording will start when any of the events above become active, and stop when all events are inactive again.

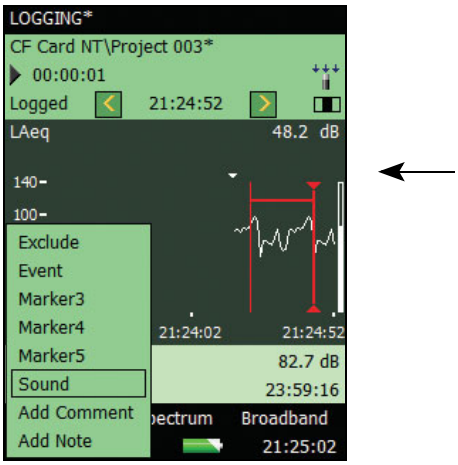
If *Pre-recording Time* has been set, then the recording will start this time before the Event appears. This is possible because the recording is done continuously in an internal buffer, ready to be saved as a wave file. The Pre-recording Time is limited by this buffer size and the Recording Quality – see details in Appendix A.

Note: Very long sound recordings will be split into wave files containing maximum 10 minutes, i.e., a 35 minute sound recording will consist of 4 wave files, three with 10 minutes sound and one with 5 minutes sound.

Control Recording using the Stylus

If *Recording Control* is set to any of the events, or to *All Events*, the recording can also be controlled using the stylus directly on the profile, in the same way as you mark sound categories – see details in Chapter 11.

Fig. 12.1
Example Logging display (showing internal buffer marker)



The small triangle above the profile indicates the amount of sound you have in the internal buffer – ready for storage in a wave-file. You will have sound from this triangle to the right-hand side of the profile. The triangle is updated every second.

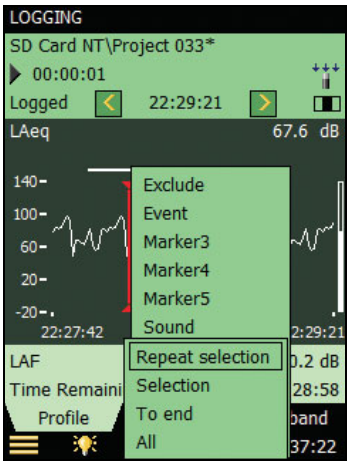
To make a sound recording using the stylus, you tap and hold the stylus on the profile display and drag it to the position where the sound recording should end, then you remove the stylus and get a dropdown menu with the possibility of setting one of the six markers. If you select *Sound*, then a sound marker is made and the sound for the marked interval is stored in a wave file. Only the portion of the sound available in the internal buffer (to the right of the small triangle) will be stored and the sound marker will only indicate this part.

Note: when selecting an interval for storing (or setting a marker), the profile display freezes, but the sound recording is still updated in the internal buffer. The part of the buffer available on the screen will decrease and you will see the small triangle move to the right. Be sure not to wait too long in selecting the Sound marker from the dropdown menu – otherwise the sound recording will disappear from the internal buffer.

Playing the Recording

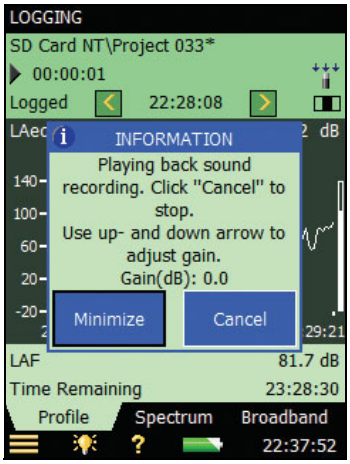
You play-back the sound simply by selecting part of the marker – as described in "Editing Markers on Profiles" on page 81 – and choose *Play Sound* from the resulting dropdown menu. The following dropdown menu will then appear, see Fig. 12.2.

Fig. 12.2
Playing the recording – the dropdown menu



Select one of the four ways of playing a sound: *Selection* will play the part you have selected; *Repeat Selection* will play the selected part until you press *Cancel* on the pop-up menu; *To End* will play the sound from the position you selected the sound marker to the end; and finally *All* will play the entire sound recording, regardless of your selection point.

Fig. 12.3
Playing the recording – output level pop-up



When you have selected the method of play-back, a pop-up appears explaining how to adjust the output level in the headphone and how to stop the play-back.

Tap on the *Minimize* button to reduce this to a small blue bar at the top of the screen – allowing you to watch the profile underneath – you will notice that the profile cursor is updated every second to the position of the sound that is currently being played.

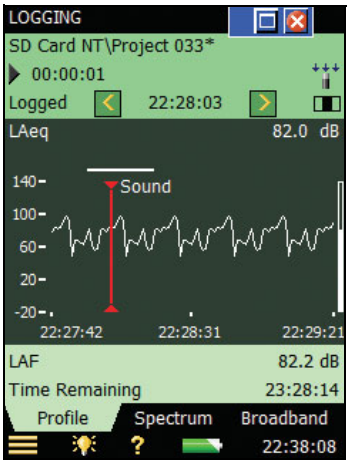


Fig. 12.4
Playing the recording – minimizing the pop-up

The small blue button bar at the top can be maximized again by tapping the icon, or you can close it and stop playing back by tapping the icon.

Sound Recordings on the PC

When projects including sound recording have been transferred into an Archive on a PC using Utility Software BZ 5503, then sound recordings on Sound Level Meter projects or Frequency Analysis Projects can be played back directly from BZ 5503.

Sound recordings on profiles can be played back when the Logging projects have been transferred to Noise Explorer, Evaluator or Protector – the sound recording will appear in the profiles as Sound markers.

Sound Recordings can be input to the Brüel & Kjær PULSE Analyzer Platform for further analysis – please contact your local Brüel & Kjær representative for further information.

Note: When recording sound for further analysis in PULSE, be sure to record the Z-weighted signal and select *Automatic Gain Control* to *Off* under the *Sound Recording* parameters and select the *Recording Quality* to match your needs for frequency content – see details on sampling frequency in Appendix A.

When *Automatic Gain Control* is set to *Off*, then the calibration information is stored in the wave files – allowing PULSE to analyse the sound recordings, taking the calibration into account.

Chapter 13

Specifications

This chapter comprises the specifications that are needed for evaluation of instrument performance characteristics and proper use of the instrument. Some of the applicable sound level meter standards require additional technical documentation, in particular for pattern evaluation (type approval) purposes, but have no bearing on normal use. The additional technical documentation is given in a separate Brüel & Kjær instruction manual (BE 1712).

Type 2250 Platform

Specifications apply to Type 2250 fitted with Microphone Type 4189 and Microphone Preamplifier ZC 0032

SUPPLIED MICROPHONE
Type 4189: Prepolarized Free-field ½″ Microphone
Nominal Open-circuit Sensitivity: 50 mV/Pa (corresponding to −26 dB re 1 V/Pa) ± 1.5 dB
Capacitance: 14 pF (at 250 Hz)

MICROPHONE PREAMPLIFIER ZC 0032
Nominal Preamplifier Attenuation: 0.25 dB
Connector: 10-pin LEMO
Extension Cables: Up to 100 m in length between the microphone preamplifier and Type 2250, without degradation of the specifications
Accessory Detection: Windscreen UA 1650 can be automatically detected when fitted over ZC 0032

MICROPHONE POLARIZATION VOLTAGE
Selectable between 0 V and 200 V

SELF-GENERATED NOISE LEVEL
Typical values at 23°C for nominal microphone open circuit sensitivity:

Weighting	Microphone	Electrical	Total
"A"	14.6 dB	12.6 dB	16.7 dB
"C"	13.6 dB	13.1 dB	16.4 dB
"Z" 5 Hz–20 kHz	15.3 dB	18.6 dB	20.3 dB
"Z" 3 Hz–20 kHz	15.3 dB	25.0 dB	25.4 dB

KEYBOARD
Pushbuttons: 11 keys with backlight, optimised for measurement control and screen navigation

ON-OFF BUTTON
Function: Press 1 s to turn on; press 1 s to enter standby; press for more than 5 s to switch off

STATUS INDICATORS
LEDs: Red, amber and green

DISPLAY
Type: Transflective back-lit colour touch screen 240 × 320 dot matrix
Colour Schemes: Five different – optimised for different usage scenarios (day, night, etc.)
Backlight: Adjustable level and on-time

USER INTERFACE
Measurement Control: Using pushbuttons on keyboard
Setup and Display of Results: Using stylus on touch screen or pushbuttons on keyboard
Lock: Keyboard and touch screen can be locked and unlocked

USB INTERFACE
USB 1.1 OTG Mini B socket

MODEM INTERFACE
Hayes compatible GSM or standard analogue modems connected through the Compact Flash slot

INPUT SOCKET
Connector: Triaxial LEMO
Input Impedance: ≥ 1 MΩ
Direct Input: Max. input voltage: ± 14.14 V_{peak}
CCLD Input: Max. input voltage: ± 7.07 V_{peak}
CCLD Current/voltage: 4 mA/25 V

TRIGGER SOCKET
Connector: Triaxial LEMO
Max. Input Voltage: ± 20 V_{peak}
Input Impedance: > 1 MΩ

OUTPUT SOCKET
Connector: Triaxial LEMO
Max. Peak Output Level: ± 4.46 V
Output Impedance: 50 Ω

HEADPHONE SOCKET
Connector: 3.5 mm Minijack stereo socket
Max. Peak Output Level: ± 1.4 V
Output Impedance: 2.2 Ω in each channel

MICROPHONE FOR COMMENTARY
Microphone, which utilises Automatic Gain Control (AGC), is incorporated in underside of instrument. Used to create voice annotations for attaching to measurements

EXTERNAL DC POWER SUPPLY REQUIREMENTS
Used to charge the battery pack in the instrument
Voltage: 8 – 24 V DC, ripple voltage < 20 mV
Current Requirement: min. 1.5 A
Power Consumption: < 2.5 W, without battery charging, < 10 W when charging
Cable Connector: LEMO Type FFA.00, positive at centre pin

BATTERY PACK
Type: Li-Ion rechargeable
Typical Operating Time: > 8 hours

STORAGE SYSTEM
Internal Flash-RAM (non-volatile): 20 Mbyte for user setups and measurement data
External Secure Digital Memory Card (SD-card): For store/recall of measurement data
External Compact Flash Memory Card (CF-card): For store/recall of measurement data

CLOCK
Back-up battery powered clock. Drift < 0.5 s per 24 hour period

WARM-UP TIME
From Power Off: < 2 minutes
From Standby: < 10 seconds for prepolarized microphones

TEMPERATURE
IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat.
Operating Temperature: –10 to + 50°C (14 to 122°F), < 0.1 dB
Storage Temperature: –25 to +70°C (–13 to +158°F)

HUMIDITY
IEC 60068–2–78: Damp Heat: 90% RH (non-condensing at 40°C (104°F)).
Effect of Humidity: < 0.1 dB for 0% < RH < 90% (at 40°C (104°F) and 1 kHz)

MECHANICAL
Environmental Protection: IP44

Non-operating:
IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s^2, 10 – 500 Hz
IEC 60068–2–27: Shock: 1000 m/s^2
IEC 60068–2–29: Bump: 4000 bumps at 400 m/s^2

WEIGHT AND DIMENSIONS
650 g (23 oz.) including rechargeable battery
$300 \times 93 \times 50$ mm ($11.8 \times 3.7 \times 1.9''$) including preamplifier and microphone

LANGUAGE
User Interface in Catalan, Croatian, Czech, Danish, English, Flemish, French, German, Hungarian, Japanese, Italian, Polish, Romanian, Serbian, Slovenian, Spanish and Swedish

HELP
Concise context-sensitive help in Catalan, English, French, German, Italian, Polish, Romanian, Serbian, Slovenian and Spanish

Software Specifications – 2250 Sound Level Meter Software BZ 7222

Conforms with the following National and International Standards:
- IEC 61672 – 1 (2002–05) Class 1
- IEC 60651 (1979) plus Amendment 1 (1993–02) and Amendment 2 (2000–10), Type 1
- IEC 60804 (2000–10), Type 1
- DIN 45657 (1997–07)
- ANSI S1.4 – 1983 (R 2001), Type 1
- ANSI S1.43–1997 (R 2002), Type 1

Note: The International IEC Standards are adopted as European standards by CENELEC. When this happens, the letters IEC are replaced with EN and the number is retained. Type 2250 also conforms to these EN Standards

TRANSDUCERS
Transducers are described in a transducer database with information on Serial Number, Nominal Sensitivity, Polarization Voltage, Free-field Type, CCLD required, Capacitance and additional information.
The analogue hardware is set up automatically in accordance with the selected transducer

CORRECTION FILTERS
For microphones of known types, BZ 7222 is able to correct the frequency response to compensate for:
Sound Field: Free-field or Diffuse-field
Accessories: None, Windscreen UA 1650 or Outdoor Microphone Kit UA 1404

DETECTORS
Parallel Detectors on every measurement:
A-weighted broadband detector channel with three exponential time weightings (Fast, Slow, Impulse), one linearly averaging detector and one peak detector
C- or Z-weighted (switchable) as for A-weighted
Overload Detector: Monitors the overload outputs of all the frequency weighted channels

MEASUREMENTS
X = frequency weightings C or Z
V = frequency weightings A, C or Z
Y = time weightings F or S
N = number between 0.1 and 99.9
For Display and Storage

Start Time	Stop Time	Overload %
Elapsed Time	L_{Aeq}	L_{Xeq}
L_{AE}	L_{Xeq}-L_{Aeq}	L_{Vpeak}
L_{ASmax}	L_{AFmax}	L_{AImax}
L_{XSmax}	L_{XFmax}	L_{XImax}
L_{ASmin}	L_{AFmin}	L_{AImin}
L_{XSmin}	L_{XFmin}	L_{XImin}
L_{AIeq}	L_{XIeq}	L_{AIeq}-L_{Aeq}
L_{AFTeq}	L_{AFTeq}-L_{Aeq}	
L_{AN1} or L_{AYN1}	L_{AN2} or L_{AYN2}	L_{AN3} or L_{AYN3}
L_{AN4} or L_{AYN4}	L_{AN5} or L_{AYN5}	L_{AN6} or L_{AYN6}
L_{AN7} or L_{AYN7}	Time Remaining	

Only for Display as Numbers or Quasi-analogue Bars

L_{AS}	L_{AF}	L_{AI}
L_{XS}	L_{XF}	L_{XI}
$L_{AS(SPL)}$	$L_{AF(SPL)}$	$L_{AI(SPL)}$
$L_{XS(SPL)}$	$L_{XF(SPL)}$	$L_{XI(SPL)}$

MEASURING RANGES

Dynamic Range: From typical noise floor to max. level for a 1 kHz pure tone signal, A-weighted: 16.7 to 140 dB

Linearity Range: In accordance with IEC 60804, A-weighted, 1 kHz: 22.9 dB to 140 dB

Linear Operating Range: In accordance with IEC 61672, A-weighted, 1 kHz: 26.3 dB to 140 dB

Peak C Range: In accordance with IEC 61672: 30.4 dB to 143 dB

SAMPLING FOR STATISTICS

The Statistics can be based on either L_{AF}, L_{AS} or L_{Aeq}:

- Statistics L_{AFN1-7} or L_{ASN1-7} are based on sampling L_{AF} or L_{AS}, resp., every 10 ms into 0.2 dB wide classes over 120 dB
- Statistics L_{AN1-7} are based on sampling L_{Aeq} every second into 0.2 dB wide classes over 120 dB

Full distribution saved with measurement

MEASUREMENT DISPLAYS

SLM: Measurement data displayed as numbers of various sizes and one quasi-analogue bar
Measured data are displayed as dB values, housekeeping data as numbers in relevant format. Instantaneous measurement L_{AF} is displayed as a quasi-analogue bar

MEASUREMENT CONTROL

Manual: Manually controlled single measurement
Automatic: Pre-set measurement time from 1 s to 24 hours in 1 s steps
Manual Controls: Reset, Start, Pause, Back-erase, Continue and Store the measurement manually

BACK-ERASE

The last 5 s of data can be erased without resetting the measurement

MEASUREMENT STATUS

On Screen: Information such as overload and running/paused are displayed on screen as icons
Traffic Lights: Red, yellow and green LEDs show measurement status and instantaneous overload as follows:

- Yellow LED flash every 5 s = stopped, ready to measure
- Green LED flashing slowly = awaiting calibration signal
- Green LED on constantly = measuring
- Yellow LED flashing slowly = paused, measurement not stored
- Red LED flashing quickly = intermittent overload, calibration failed

CALIBRATION

Initial calibration is stored for comparison with later calibrations
Acoustic: Using Sound Calibrator Type 4231 or custom calibrator. The calibration process automatically detects the calibration level when Sound Calibrator Type 4231 is used
Electrical: Uses internally generated electrical signal combined with a typed-in value of microphone sensitivity
Calibration History: Up to 20 of the last calibrations made are listed and can be viewed on the instrument

SIGNAL MONITORING

The input signal can be monitored using an earphone/headphones connected to the headphone socket, or it can be fed to the output socket
Output Signal: Input conditioned; A-, C- or Z-weighted
Gain Adjustment: –60 dB to 60 dB
Headphone Signal: Input signal can be monitored using this socket with headphones/earphones
Gain Adjustment: –60 dB to 60 dB

VOICE ANNOTATIONS

Voice annotations can be attached to measurements so that verbal comments can be stored together with the measurement
Playback: Playback of voice annotations can be listened to using an earphone/headphones connected to the headphone socket
Gain Adjustment: –60 dB to 0 dB

TEXT ANNOTATIONS

Text annotations can be attached to measurements so that written comments can be stored with the measurement

DATA MANAGEMENT

Project Template: Defines the display and measurement setups
Project: Measurement data stored with the Project Template
Job: Projects are organised in Jobs
Explorer facilities for easy management of data (copy, cut, paste, delete, rename, view data, open project, create job, set default project name)

USERS

Multi-user concept with login. Users can have their own settings with jobs and projects totally independent of other users

PREFERENCES

Date, Time and Number formats can be specified per user

Software Specifications – 2250 Frequency Analysis Software BZ 7223

The specifications for BZ 7223 include the specifications for 2250 Sound Level Meter Software BZ 7222. BZ 7223 adds:

STANDARDS
Conforms with the following National and International Standards:
- IEC 61260 (1995–07) plus Amendment 1 (2001–09), 1/1-octave Bands and 1/3-octave Bands, Class 0
- ANSI S1.11 – 1986 (R 1993), 1/1-octave Bands and 1/3-octave Bands, Order 3, Type 0–C
- ANSI S1.11 – 2004, 1/1-octave Bands and 1/3-octave Bands, Class 0

CENTRE FREQUENCIES
1/1-octave Band Centre Frequencies: 8 Hz to 16 kHz
1/3-octave Band Centre Frequencies: 6.3 Hz to 20 kHz

MEASUREMENTS
X = frequency weightings A, C or Z

Spectra for Display and Storage

L_{Xeq}	L_{XSmax}	L_{XFmax}
L_{XSmin}	L_{XFmin}	

Spectra for Display Only

L_{XS}	L_{XF}

Single Values

SIL	PSIL	$L_{Aeq\ (20\text{-}200\ Hz)}$

MEASURING RANGES
Dynamic Range: From typical noise floor to max. level for a pure tone signal at 1 kHz 1/3-octave: 1.7 to 140 dB

MEASUREMENT DISPLAYS
Spectrum: One or two spectra superimposed + A and C/Z broadband bars
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto zoom or auto scale available
Cursor: Readout of selected band

Software Specifications – 2250 Logging Software BZ 7224

The specifications for BZ 7224 include the specifications for 2250 Sound Level Meter Software BZ 7222. BZ 7224 adds:

MEASUREMENTS
Logging: Measurement data logged at pre-set periods into files on external SD- or CF-cards
Logging Period: From 1 s to 24 hours with 1 s resolution
Fast Logging: L_{AF} and L_{Aeq} can be logged every 100 ms, irrespective of logging period
Broadband Data Stored at each Logging Interval: All, or up to 10 selectable broadband data
Broadband Statistics Stored at each Logging Interval: Full distribution, or none
Spectrum Data Stored at each Logging Interval: All, or up to 3 selectable spectra (license for BZ 7223 required)
Logging Time: From 1 second to 31 days with 1 s resolution
Measurement Total: For the logging time, in parallel with logging: All broadband data, statistics and spectra (license for BZ 7223 required)

MARKERS
One data exclusion marker and four user-definable markers for on-line marking of sound categories heard during the measurement
Events can be set manually, or an event can be triggered when a broadband level is above or below a specified level

ANNOTATIONS
On-line annotations with spoken comments or written notes

MEASUREMENT DISPLAYS
Profile: Graphical display of selectable measurement data versus time
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto zoom or auto scale available
X-axis: Scroll facilities
Cursor: Readout of measurement data at selected time

Software Specifications – Sound Recording Option BZ 7226

Sound Recording Option BZ 7226 is enabled with a separate license. It works with all the software described in this manual: Sound Level Meter, Frequency Analysis, and Logging Software.

RECORDED SIGNAL
A-, C- or Z-weighted signal from the measurement transducer.

AUTOMATIC GAIN CONTROL
The average level of the signal is kept within a 40 dB range, or the gain can be fixed

SAMPLING RATE AND PRE-RECORDING
Sound is buffered for the pre-recording of sound. This allows the beginning of events to be recorded even if they are only detected later.

Sampling Rate (kHz)	Maximum Pre-recording (s)	Sound Quality	Memory (KB/s)
8	100	Low	16
16	50	Fair	32
24	30	Medium	48
48	10	High	96

FUNCTIONS WITH BZ 7222 AND BZ 7223
Manual Control of Recording: Recording can be manually started and stopped during a measurement using a pushbutton or an external signal

Automatic Control of Recording: Start of recording when measurement is started. Minimum and Maximum recording time can be preset

FUNCTIONS WITH BZ 7224
Manual Control of Recording (using Manual Event or Back-erase pushbutton, or an external signal): Recording during all of the event, or for preset minimum and maximum duration. A Sound marker is set while recording. Selectable pre- and post-recording time
Manual Control of Recording (using touch screen): Recording for the selected time period (subject to the limitations of the pre-recording buffer). A Sound marker is set for the selected time period
Automatic Control of Recording: An event can be triggered when a broadband level is above or below a specified level. Recording during all of the event or for preset minimum and maximum duration. Selectable pre- and post-recording time

PLAYBACK
Playback of sound recordings can be listened to using the earphone/headphones connected to the headphone socket

RECORDING FORMAT
The recording format is wave files (extension .wav) attached to the data in the project, easily played-back afterwards on a PC using Type 7815, 7820 or 7825. Calibration information is stored in the wav file, allowing PULSE to analyse the recordings

Software Specifications – Utility Software for Hand-held Analyzers BZ 5503

BZ 5503 is included with Type 2250 for easy synchronisation of setups and data between PC and Type 2250. BZ 5503 is supplied on CD-ROM BZ 5298

ON-LINE DISPLAY OF TYPE 2250 DATA
Measurements on Type 2250 can be controlled from the PC and displayed on-line with the PC, using the same user interface on the PC as on Type 2250

DATA MANAGEMENT
Explorer: Facilities for easy management of Instruments, Users, Jobs, Projects and Project Templates (copy, cut, paste, delete, rename, create)
Data Viewer: View measurement data (content of projects)
Template Editor: Editor for changing setups in Project Templates

Synchronisation: Project Templates and Projects for a specific user can be synchronised between PC and Type 2250

USERS
Users of Type 2250 can be created or deleted

EXPORT FACILITIES
Excel: Projects (or user specified parts) can be exported to Microsoft® Excel
Type 7810/12/15/16/20/25: Projects can be exported to Predictor Type 7810, Lima Type 7812, Noise Explorer Type 7815, Acoustic Determinator Type 7816, Evaluator Type 7820 or Protector Type 7825

TYPE 2250 SOFTWARE UPGRADES AND LICENSES
The utility software controls Type 2250 software upgrades and licensing of the Type 2250 applications

INTERFACE TO TYPE 2250
USB ver. 1.1 or Hayes compatible GSM or standard analogue modem

PC REQUIREMENT
Operating System: Windows® 2000/Windows® XP, Microsoft®.NET

Recommended PC: Pentium® III (or equivalent) processor, 128 Mbyte RAM, SVGA graphics display/ adaptor, sound card, CD ROM drive, mouse, USB, Windows® XP

Ordering Information

PACKAGES

Type 2250 A	Hand-held Analyzer with Sound Level Meter Software
Type 2250 B	Hand-held Analyzer with Sound Level Meter and Frequency Analysis Software
Type 2250 C	Hand-held Analyzer with Sound Level Meter and Logging Software
Type 2250 D	Hand-held Analyzer with Sound Level Meter, Frequency Analysis and Logging Software

SOFTWARE MODULES AVAILABLE SEPARATELY

BZ 7223	2250 Frequency Analysis Software
BZ 7224	2250 Logging Software
BZ 7226	2250 Sound Recording Option

COMPONENTS INCLUDED WITH TYPE 2250 HAND-HELD ANALYZER

Type 4189	Prepolarized Free-field 1/2″ Microphone
ZC 0032	Microphone Preamplifier
AO 1476	USB Standard A to USB Mini B Interface Cable, 1.8 m (6 ft)
BZ 5298	Environmental Software, including Utility Software for Hand-held Analyzers
UA 1650	90 mm dia. Windscreen with AutoDetect
UA 1651	Tripod Extension for Hand-held Analyzer
UA 1673	Adaptor for Standard Tripod Mount
DH 0696	Wrist Strap
KE 0440	Travel Bag
KE 0441	Protective Cover for Type 2250
FB 0679	Hinged Cover for Hand-held Analyzer
HT 0015	Earphones
UA 1654	5 Extra Styli
QB 0061	Battery Pack
ZG 0426	Mains Power Supply

COMPONENTS INCLUDED WITH 2250 LOGGING SOFTWARE BZ 7224

UL 1009	SD Memory Card for Hand-held Analyzers

COMPONENTS INCLUDED WITH 2250 SOUND RECORDING OPTION BZ 7226

UL 1009	SD Memory Card for Hand-held Analyzers

ACCESSORIES AND COMPONENTS AVAILABLE SEPARATELY

ANALYZER

ZG 0444	Charger for QB 0061 Battery Pack

CALIBRATION

Type 4231	Sound Level Calibrator (fits in KE 0440)
Type 4226	Multifunction Acoustic Calibrator
Type 4228	Pistonphone
2250 CAI	Accredited Initial Calibration of Type 2250
2250 CAF	Accredited Calibration of Type 2250
2250 CTF	Traceable Calibration of Type 2250
2250 TCF	Conformance Test of Type 2250, with certificate

MEASURING

Type 3592	Outdoor Measuring Gear (see Product Data BP 1744)
AO 0440-D-015	Signal cable, LEMO to BNC, 1.5 m (5 ft)
AO 0646	Sound Cable, LEMO to Minijack, 1.5 m (5 ft)
AO 0441-D-030	Microphone Extension Cable, 10-pin LEMO, 3 m (10 ft)
AO 0441-D-100	Microphone Extension Cable, 10-pin LEMO, 10 m (33 ft)
UA 0587	Tripod
UA 0801	Small Tripod
UA 1317	Microphone Holder
UA 1404	Outdoor Microphone Kit
UA 1672	AutoDetect Insert for UA 1650

INTERFACING

Type 7815	Noise Explorer – data viewing software
Type 7820	Evaluator – data viewing and calculation software
Type 7825	Protector – software for calculation of Personal Noise Exposure

SERVICE PRODUCTS

2250-EW1	Extended Warranty, one year extension

2250-MW1 5 Years Warranty including yearly Accredited Calibration – annual payment

2250-MW5 5 Years Warranty including yearly Accredited Calibration

Compliance with Standards

CE C-Tick	CE-mark indicates compliance with the EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand.
Safety	EN/IEC 61010 – 1: Safety requirements for electrical equipment for measurement, control and laboratory use. UL 61010B–1: Standard for Safety – Electrical measuring and test equipment.
EMC Emission	EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device. IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards
EMC Immunity	EN/IEC 61000–6–2: Generic standard – Immunity for industrial environments. EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements. IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards

Appendix A

Setup Parameters

This appendix describes all the setup parameters included in a template.

Input

Table A.1 *Input parameters*

Parameter	Values	Comment
Input	*Top Socket* *Rear Socket*	Determines whether the input is taken from the top socket or the rear socket ('Input' on connector panel). Connect your transducer to this socket
Sound Field Correction	*Free-field* *Diffuse-field*	Select a correction matching the sound field of your measurements. i.e., you can make correct measurements in a diffuse-field using a Type 4189 free-field microphone, by selecting *Diffuse-field* correction. Even free-field correction of a free-field microphone will enhance the overall frequency response of the system. Generally, ISO requires free-field conditions and ANSI requires diffuse-field conditions.Check your local standards for the setting you require. No correction is made for unknown transducers

For outdoor measurements, it is often necessary to mount a windscreen on the microphone to damp the influence of the wind. This has, however, a small impact on the overall frequency response of the analyzer. To compensate for this, use the built in windscreen correction.

Table A.2 *Input parameters, with windscreen correction*

Parameter	Values	Comment
Windscreen Auto Detect	*On* *Off*	Automatic detection of UA 1650 windscreen when mounted on the ZC 0032 microphone preamplifier. The preamplifier should be connected to the top socket, if necessary using a microphone extension cable
Windscreen Correction	*None* *UA 1650* *UA 1404*	If *Windscreen Auto Detect* is set to *Off*, you can manually select a windscreen correction suitable for the windscreen in use. No correction is made for unknown transducers
Extended Low Frequency	*On* *Off*	Use this parameter to extend the low frequency of the broadband measurements and the frequency analysis. However, be aware that the measurements will be more sensitive to very low frequency noise such as wind noise. **Extended Low Frequency Off:** Broadband Z-weighting: approx. 5 Hz to 20 kHz (–3 dB limits) Frequency analysis[a]: 1/1-octave: 16 Hz – 16 kHz 1/3-octave: 12.5 Hz – 20 kHz **Extended Low Frequency On:** Broadband Z-weighting (using a Type 4189 microphone): approx. 3 Hz to 20 kHz (–3 dB limits) Broadband Z-weighting (without microphone): approx. 0.75 Hz to 20 kHz (–3 dB limits) Frequency analysis[a]: 1/1-octave: 8 Hz – 16 kHz 1/3-octave: 6.3 Hz – 20 kHz

Table A.2 *Input parameters, with windscreen correction*

Parameter	Values	Comment
Trigger Input	*None*	This parameter should be set to match the equipment connected to the Trigger Input Socket on the connector panel of Type 2250. Set it to *None*, if not used.
	MATRON Handswitch	Set *Trigger Input* to *MATRON Handswitch* if Type 2250 is being used in the MATRON system. (MATRON is a dedicated neighbour complaint system. For UK customers only). Please contact your local Brüel & Kjær representative for further information.
	Voltage Level	Set Trigger input to *Voltage Level* if you want to control sound recording by a voltage level generated by external equipment. The Voltage Level should generate at least 2 V for On and less than 1 V for Off. The duration of the steady level should be at least 1 s, so it can be recognised by Type 2250

a. Requires Frequency Analysis Software BZ 7223

Frequency Weightings

Table A.3 *Frequency weighting parameters*

Parameter	Values	Comment
Broadband (excl. Peak)	*AC* *AZ*	All broadband parameters (except L_{peak}) are measured simultaneously with two different frequency weightings – select the weightings here
Broadband Peak	*A* *C* *Z*	One broadband peak parameter L_{peak} is measured, select the frequency weighting here
Spectrum[a]	*A* *C* *Z*	The frequency analysis (1/1-octave or 1/3-octave) will be frequency weighted in accordance with this parameter

a. Requires Frequency Analysis Software BZ 7223

Bandwidth

Table A.4 *Bandwidth parameters*

Parameter	Values	Comment
Bandwidth[a]	*1/1-octave* *1/3-octave*	Bandwidth of frequency analysis

a. Requires Frequency Analysis Software BZ7223

Statistics

Table A.5 *Statistics parameters*

Parameter	Values	Comment
Statistics based on	L_{Aeq} L_{AF} L_{AS}	The statistics are based on sampling the broadband parameter L_{AF} or L_{AS} each 10 ms or L_{Aeq} each second
Percentile N1	*0.1 to 99.9*	User-defined percentile level where the value of L_{AN1} is exceeded for N1% of the elapsed time
Percentile N2	*0.1 to 99.9*	User-defined percentile level where the value of L_{AN2} is exceeded for N2% of the elapsed time
Percentile N3	*0.1 to 99.9*	User-defined percentile level where the value of L_{AN3} is exceeded for N3% of the elapsed time
Percentile N4	*0.1 to 99.9*	User-defined percentile level where the value of L_{AN4} is exceeded for N4% of the elapsed time
Percentile N5	*0.1 to 99.9*	User-defined percentile level where the value of L_{AN5} is exceeded for N5% of the elapsed time
Percentile N6	*0.1 to 99.9*	User-defined percentile level where the value of L_{AN6} is exceeded for N6% of the elapsed time
Percentile N7	*0.1 to 99.9*	User-defined percentile level where the value of L_{AN7} is exceeded for N7% of the elapsed time

The percentile levels N1 to N7 can be changed after the measurement has been done.

Measurement Control

Table A.6 *Measurement Control parameters*

Parameter	Values	Comment
Measurement Mode[a]	*Manual* *Automatic*	Determines whether the measurement is under *Manual* control (fully controlled by the **Reset** and **Start/Pause** pushbuttons), or *Automatic* control (start of measurement controlled by the **Reset** and **Start/Pause** pushbuttons, end of measurement automatically controlled by the instrument when pre-set time has elapsed)
Pre-set Time[a]	*00:00:01 to 24:00:00*	Fixes the duration of a measurement from start to automatic stop (in hours, minutes and seconds). Any pauses made during the measurement via the **Start/Pause** pushbutton are not counted in the pre-set time
Logging Time[b]	*0.00:00:01 to 31.00:00:00*	Fixes the duration of a measurement from start to automatic stop (in days, hours, minutes and seconds)
Logging Period[b]	*00:00:01 to 24:00:00*	Sets the period of the logging (in hours, minutes and seconds)
Synchronize with Clock[b]	*Yes* *No*	Select *Yes* to synchronise the logging intervals with whole minutes or hours, e.g., if Logging Period is set to 00:01:00 (1 minute) and you start the measurement at 8:12:33, then the first logging interval will be from 8:12:33 to 8:12:59 (27 seconds), the second will be from 8:13:00 to 8:13:59 (60 seconds), etc. Select *No* if you want every logging interval to be exactly the specified Logging Period

a. For Sound Level Meter (BZ 7222) and Frequency Analyzer (BZ 7223) templates only.
b. For Logging (BZ 7224) templates only.

Logged Broadband

Table A.7 *Logged Broadband parameters*[a]

Parameter	Values	Comment
Full Statistics	*Yes* *No*	Determines whether the full broadband statistics are logged or not
Broadband Parameters	*All* *Selected*	Determines whether all broadband parameters are logged or a selected part is logged (up to 10 parameters)

Table A.7 *Logged Broadband parameters*[a]

Parameter	Values	Comment
Parameter 1 to Parameter 10	L_{Aeq} L_{Xeq} L_{Xeq}-L_{Aeq} L_{AE} L_{Vpeak} L_{AFmax} L_{ASmax} L_{AImax} L_{XFmax} L_{XSmax} L_{XImax} L_{AFmin} L_{ASmin} L_{AImin} L_{XFmin} L_{XSmin} L_{XImin} L_{AIeq}-L_{XIeq} L_{XIeq}-L_{Aeq} L_{AFTeq} L_{AFTeq}-L_{Aeq}	This parameter can be set if Broadband Parameters = Selected. X = frequency weightings C or Z (controlled by **Setup** – *Frequency Weightings – Broadband (excl. Peak)* parameter). V = frequency weightings A, C or Z (controlled by **Setup** – *Frequency Weightings – Broadband Peak* parameter)

a. For Logging (BZ 7224) templates only.

Logged Broadband (100 ms)

Table A.8 *Logged Broadband (100 ms) parameters*[a]

Parameter	Values	Comment
L_{Aeq}	*On* *Off*	Select *On* to log L_{Aeq} (with an elapsed time of 100 ms and a logging period of 100 ms)
L_{AF}	*On* *Off*	Select *On* for logging of L_{AF} every 100 ms

a. For Logging (BZ 7224) templates only.

Logged Spectrum

Table A.9 *Logged Spectrum parameters*[a]

Parameter	Values	Comment
Spectrum Parameters	*All* *Selected* *None*	Determines whether all Spectrum parameters are logged, a selected part of the parameters are logged (up to 3 parameters) or none are logged
Spectrum 1 to Spectrum 3	L_{Xeq} L_{XFmax} L_{XSmax} L_{XFmin} L_{XSmin} *Off*	These parameters can be set if Spectrum Parameters = Selected. X = frequency weightings A, C or Z (controlled by **Setup** – *Frequency Weightings* – *Spectrum* parameter)

a. For Logging (BZ7224) templates only, requires Frequency Analysis Software BZ7223.

Markers

Table A.10 *Markers*[a]

Parameter	Values	Comment
Marker 1	*Text string*	Default set to 'Exclude'. This marker can be set using the stylus in the profile or the **Back-erase** pushbutton during a measurement
Marker 2	*Text string*	Default set to 'Manual'. This marker can be set using the stylus in the profile or the **Manual Event** pushbutton during a measurement
Marker 3	*Text string*	Default set to 'Level'. This marker can be set using the stylus in the profile, or if the conditions for the Level Trigger are met during a measurement
Marker 4 and Marker 5	*Text string*	These markers can be set using the stylus in the profile display
Marker 6	*Text String*	Default set to 'Sound'. This marker is set if a sound recording is made during a measurement
Pre-marker Time	*0 to 5 s*	Specifies number of seconds marker 1, marker 2 or marker 3 will be set ahead of the point where the **Back-erase** or the **Manual Event** pushbuttons are pressed or the level trigger conditions are fulfilled

a. For Logging (BZ7224) templates only.

Level Trigger

Table A.11 *Level Trigger parameters*[a]

Parameter	Values	Comment
Level Trigger Control	*On* *Off*	Set to *On* for setting Marker 3 (Level) when the *Trigger Parameter* fulfils the Level Trigger conditions (see below). The conditions are checked every second. Sound Recording[b] can also be controlled by these settings, see **Setup** – *Sound Recording* – *Recording Control*
Start Slope	*Rising* *Falling*	Set to *Rising* to start when level goes above *Start Level* (and then stop when level goes below *Stop Level*). Set to *Falling* to start when level goes below *Start Level* (and stop when level goes above *Stop Level*)
Start Level	*–100 to 200 dB*	Start trigger conditions are fulfilled, when level crosses *Start Level* (in accordance with *Start Slope*) for at least *Start Duration* seconds – set *Start Level here*
Start Duration	*0 to 15 s*	Start trigger conditions are fulfilled, when level crosses *Start Level* (in accordance with *Start Slope*) for at least *Start Duration* seconds – set *Start Duration here*
Stop Level	*–100 to 200 dB*	Stop trigger conditions are fulfilled, when level crosses *Stop Level* (in accordance with *Start Slope*) for at least *Stop Duration* seconds – set *Stop Level here*
Stop Duration	*0 to 15 s*	Stop trigger conditions are fulfilled, when level crosses *Stop Level* (in accordance with *Start Slope*) for at least *Stop Duration* seconds – set *Stop Duration here*

Table A.11 *Level Trigger parameters*[a]

Parameter	Values	Comment
Trigger Parameter	L_{Aeq} L_{Xeq} L_{Vpeak} L_{AFmax} L_{ASmax} L_{AImax} L_{XFmax} L_{XSmax} L_{XImax} L_{AFmin} L_{ASmin} L_{AImin} L_{XFmin} L_{XSmin} L_{XImin} $L_{AF(SPL)}$ $L_{AS(SPL)}$ $L_{AI(SPL)}$ $L_{XF(SPL)}$ $L_{XS(SPL)}$ $L_{XI(SPL)}$	Select which parameter to monitor for the level trigger. The parameter is based on 1 second measurements and checked every second regardless of the logging period and logged parameters. X = frequency weightings C or Z (controlled by **Setup** – *Frequency Weightings – Broadband (excl. Peak)* parameter). V = frequency weightings A, C or Z (controlled by **Setup** – *Frequency Weightings – Broadband Peak* parameter)

a. For Logging (BZ7224) templates only.
b. Requires license for Sound recording BZ7226

Sound Recording

Table A.12 *Sound Recording parameters*[a]

Parameter	Values	Comment
Recording Control	*Off*	Determines how recording of the measured signal is controlled.
	Automatic	Set to *Automatic* to start the recording when the measurement is started and record throughout the measurement, only limited by the *Maximum Duration.*
	Manual Event	Set to *Manual Event* to start recording manually while measuring when the **Manual Event** pushbutton is pressed, and record until pressing the pushbutton again, however, take *Maximum* and *Minimum Duration* into account.
	Exclude Event[b]	Set to *Exclude Event* to start recording manually while measuring when the **Back-erase** pushbutton is pressed, and record until pressing the pushbutton again, however, take *Maximum* and *Minimum Duration* into account.
	External Event	Set to *External Event* to start recording using external equipment connected to the Trigger Input Socket.
	Level Trigger Event[b]	Set to *Level Trigger Event* to record while the level trigger conditions are fulfilled, however, take *Maximum* and *Minimum Duration* into account.
	All Events[b]	Set to *All Events* to record while any of the events above are active, however, take *Maximum* and *Minimum Duration* into account.
		If you don't want to record the input signal, then set *Recording Control* to *Off*, to economise on power
Recording Quality	*Low* *Fair* *Medium* *High*	This setup determines the quality of the recording by adjusting the sampling rate. The amount of space required for the recording on the memory card will depend on the selected quality: Quality / Sampling freq. / Upper freq. / Memory Low 8 kHz 3 kHz 16 KB/s Fair 16 kHz 6 kHz 32 KB/s Medium 24 kHz 10 kHz 48 KB/s High 48 kHz 20 kHz 96 KB/s

Table A.12 *Sound Recording parameters*[a]

Parameter	Values	Comment
Recorded Signal	*Input A-weighted* *Input C-weighted* *Input Z-weighted*	Use this parameter to select the frequency weighting of the recorded signal. **Note:** The frequency weighting of the recorded signal can be selected independently of the frequency weighting of the measurement, the signal at the output socket and the signal at the earphone socket
Automatic Gain Control	*On* *Off*	To ease identification of sound sources, the gain can be automatically adjusted to keep the average level within a 40 dB range. When playing back the recorded signal, you will then hear clearly the whole signal content, whether the level has been 20 dB or 140 dB. Set *Automatic Gain Control* to *On* to convert the recorded signal. Set *Automatic Gain Control* to *Off* for recording the signal with a fixed gain – then set *Peak Recording Level* to fit the signal **Note:** If the sound contains very high levels at low frequency, then a fixed gain is recommended
Peak Recording Level	*140 dB* *130 dB* *120 dB* *110 dB* *100 dB* *90 dB* *80 dB* *70 dB*	The recorded signal is stored as a 16-bit wave file, which has a dynamic range of up to 96 dB. When playing back on Type 2250 the dynamic range of the output is approx. 75 dB. When playing back on a PC it might be even lower. Set *Peak Recording Level* to fit the signal. The values for *Peak Recording Level* take the sensitivity of the attached transducer into account. The values shown in the list here are nominal values for a Type 4189 microphone. **Hint:** Monitor the L_{peak} value during a trial measurement before selecting the *Peak Recording Level*

Table A.12 *Sound Recording parameters*[a]

Parameter	Values	Comment
Pre-recording Time[b]	*0 to 110 s*	Recording is started the *Pre-recording Time* before the trigger conditions are fulfilled (e.g., 5 s means the recording will be started 5 s before you hit the **Manual Event** pushbutton). This is possible because the recording is done continuously in an internal buffer, ready to be saved as a wave file. The *Pre-recording Time* is limited by this buffer size and the *Recording Quality*: Quality — Pre-recording Time limit Low — 110 s Fair — 50 s Medium — 30 s High — 10 s
Post-recording Time[b]	*0 to 300 s*	Use this parameter to specify how much extra you want to be recorded after the trigger conditions are no longer fulfilled
Duration Limit	*On* *Off*	Use this parameter to enable the *Minimum Duration* and *Maximum Duration* parameters for overruling the duration of the sound recording determined by the trigger condition parameters
Minimum Duration	*00:00:00 to 01:00:00*	When *Duration Limit* is *On*, then *Minimum Duration* will determine the minimum recording time regardless of the trigger conditions. The total record length will then (as a minimum) be the sum of *Minimum Duration*, *Pre-recording Time* and *Post-recording Time*
Maximum Duration	*00:00:01 to 01:00:00*	When *Duration Limit* is *On*, then *Maximum Duration* will determine the maximum recording time regardless of the trigger conditions. The total record length will then (as a maximum) be the sum of *Maximum Duration*, *Pre-recording Time* and *Post-recording Time*

a. Requires license for Sound recording BZ 7226.
b. For Logging (BZ 7224) templates only.

Output Socket Signal

Table A.13 *Output Socket Signal parameters*

Parameter	Values	Comment
Source	*Off* *Input A-weighted* *Input C-weighted* *Input Z-weighted*	Output to the Output socket on the connector panel. Select between *Off* and the input signal for monitoring purposes. **Note:** If you do not want to output the signal, then select *Off* to economise the power
Output Gain Input	*–80.0 dB to 60.0 dB*	Output gain of the input signal. Key in a gain value (0.1 dB resolution) for the input signal. Use '@' to assign the new value for immediate response at the output – or use the up/down navigation keys to increment/ decrement the value in steps of 1 dB. **Note:** 0 dB means 1 V output for 1 V input.

Appendix B

Measurement Parameters

This appendix describes the measurement parameters. They are measured in accordance with the setup parameters.

For 2250 Sound Level Meter Software BZ 7222, 2250 Frequency Analysis Software BZ 7223 and 2250 Logging Software BZ 7224

X = frequency weightings C or Z (controlled by **Setup** – *Frequency Weightings – Broadband (excl. Peak)* parameter)

V = frequency weightings A, C or Z (controlled by **Setup** – *Frequency Weightings – Broadband Peak* parameter)

N = number between 0.1 and 99.9 (controlled by **Setup** – *Statistics – Percentile N parameter*)

Timed Measured Parameters (measured within a controlled time interval)

Equivalent Continuous Sound Levels:

- L_{Aeq}
- L_{Xeq}
- L_{Xeq}-L_{Aeq}

Sound Exposure Level:

- L_{AE}

Peak Sound Level:

- L_{Vpeak}

Maximum Time-weighted Sound Levels:

- L_{AFmax}
- L_{ASmax}
- L_{AImax}

- L_{XFmax}
- L_{XSmax}
- L_{XImax}

Minimum Time-weighted Sound Levels:

- L_{AFmin}
- L_{ASmin}
- L_{AImin}
- L_{XFmin}
- L_{XSmin}
- L_{XImin}

Statistics to Calculate Percentile Levels:

- L_{AN1} or L_{AFN1}
- L_{AN2} or L_{AFN2}
- L_{AN3} or L_{AFN3}
- L_{AN4} or L_{AFN4}
- L_{AN5} or L_{AFN5}
- L_{AN6} or L_{AFN6}
- L_{AN7} or L_{AFN7}

General Parameters:

- Overload in %
- Start time
- Stop Time
- Elapsed Time (excl. pauses)
- Time Remaining (for the current measurement, taking available diskspace into account)

Special Parameters:

- L_{AIeq} (also called L_{AIm})
- L_{XIeq}
- L_{AIeq}-L_{Aeq}
- L_{AFTeq} (also called L_{AFTm5})
- L_{AFTeq}-L_{Aeq}
- SIL (average of L_{Zeq} octave band levels: 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz)[a]
- PSIL (average of L_{Zeq} octave band levels: 500 Hz, 1000 Hz and 2000 Hz)[a]
- L_{Aeq}(20–200 Hz) (average of power values for L_{Aeq} 1/3-octave bands from 20 Hz to 200 Hz)[a]

a. These parameters require license for BZ 7223 and measurement of spectra

Instantaneous Measured Parameters (available at any time)

Instantaneous Time-weighted Sound Levels:

- L_{AF}
- L_{AS}
- L_{AI}
- L_{XF}
- L_{XS}
- L_{XI}

Sound Pressure Levels (maximum time-weighted sound levels once per second):

- $L_{AF(SPL)}$
- $L_{AS(SPL)}$
- $L_{AI(SPL)}$
- $L_{XF(SPL)}$
- $L_{XS(SPL)}$
- $L_{XI(SPL)}$

For 2250 Frequency Analysis Software BZ 7223 and 2250 Logging Software BZ 7224 (if license available for BZ 7223)

X = frequency weightings A, C or Z (controlled by **Setup** – *Frequency Weightings – Spectrum* parameter)

Timed Measured Spectra (measured within a controlled time interval):

- L_{Xeq}
- L_{XFmax}
- L_{XSmax}
- L_{XFmin}
- L_{XSmin}

Instantaneous Measured Spectra (available at any time):

- L_{XF}
- L_{XS}

For 2250 Logging Software BZ 7224

X = frequency weightings C or Z (controlled by **Setup** – *Frequency Weightings – Broadband (excl. Peak)* parameter)

V = frequency weightings A, C or Z (controlled by **Setup** – *Frequency Weightings – Broadband Peak* parameter)

N = number between 0.1 and 99.9 (controlled by **Setup** – *Statistics – Percentile N parameter*)

Logged Parameters

Up to ten (or all) of the following parameters can be logged (with the selected logging period) and viewed in the Profile display:

Equivalent Continuous Sound Levels:

- L_{Aeq}
- L_{Xeq}
- L_{Xeq}-L_{Aeq}

Sound Exposure Level:

- L_{AE}

Peak Sound Level:

- L_{Vpeak}

Maximum Time-weighted Sound Levels:

- L_{AFmax}
- L_{ASmax}
- L_{AImax}
- L_{XFmax}
- L_{XSmax}
- L_{XImax}

Minimum Time-weighted Sound Levels:

- L_{AFmin}
- L_{ASmin}
- L_{AImin}
- L_{XFmin}
- L_{XSmin}
- L_{XImin}

Special Parameters:

- L_{AIeq} (also called L_{AIm})
- L_{XIeq}
- L_{AIeq}-L_{Aeq}
- L_{AFTeq} (also called L_{AFTm5})
- L_{AFTeq}-L_{Aeq}

The following parameters are available per set of logged parameters:

- Overload in %
- Start time
- Stop Time
- Elapsed Time (excl. pauses)

The Statistics can be logged to calculate Percentile Levels per logging interval

- L_{AN1} or L_{AFN1}
- L_{AN2} or L_{AFN2}
- L_{AN3} or L_{AFN3}
- L_{AN4} or L_{AFN4}
- L_{AN5} or L_{AFN5}
- L_{AN6} or L_{AFN6}
- L_{AN7} or L_{AFN7}

Up to three (or all) of the following Spectrum parameters can be logged and displayed on the spectrum display (if license available for BZ 7223):

- L_{Veq}
- L_{VFmax}
- L_{VSmax}
- L_{VFmin}
- L_{VSmin}

The following Broadband parameters can be logged every 100 ms:

- L_{Aeq}
- L_{AF}

Appendix C

Instrument Parameters

This appendix describes the parameters that are common to all users of the instrument.

Current Transducer

Table C.1 *Current Transducer parameters*

Parameter	Values	Comment
Transducer Used (i.e., connected to *Top Socket*)	Name and serial number of transducer	This parameter selects which transducer is connected to the *Top Socket* (displayed in **Setup** – *Input* and at the top of **Transducers** database)
Transducer Used (i.e., connected to *Rear Socket*)	Name and serial number of transducer	This parameter selects which transducer is used at *Rear Socket* (displayed in **Setup** – *Input* and at the top of **Transducers** database)
Input (no text is displayed)	*Top Socket* *Rear Socket*	Determines whether the input is taken from the top socket, or the rear socket ('Input' on connector panel). Connect your transducer to this socket. This parameter is displayed in **Setup** – *Input* and on the second line of the **Transducers** database

Transducer Database

The Transducer Database consists of a Transducer Setup and a Calibration History – one set per transducer.

Transducer Setup

Table C.2 *Transducer Setup parameters*

Parameter	Values	Comment
Serial No.	Text string	Insert unique ID for transducer
Name	Text string	Insert name of transducer to display together with serial number
Description	Text string	Insert description of transducer
Preamplifier ID No.	Text string	Document the preamplifier here
(Transducer) *Family*	*Microphone*	(Transducer) *Family* is set to *Microphone* in version 1 of this software
Microphone Type	*4189* *Unknown*	If microphone is a known type, then the rest of the parameters of the transducer are set automatically. *Sound Field Correction* and *Windscreen Correction* are possible for known microphone types only. For unknown microphone types, set the rest of the parameters – no corrections can be made for unknown types
Nominal Sensitivity	Double	Set automatically for known type, otherwise set the nominal sensitivity of the microphone in mV/Pa
Sensitivity Unit	*mV/Pa*	Can only be mV/Pa
Polarization Voltage	*Yes* *No*	Set to *No* if microphone is prepolarized, otherwise set to *Yes* for polarization voltage of 200 V (*Top Socket* only). Set automatically for known *Microphone Type*
Free-field Type	*Yes* *No*	Set to *Yes* for Free-field types, otherwise set to *No*. Set automatically for known *Microphone* type
Capacitance	Double	Insert capacitance of microphone in pF. Set automatically for known *Microphone* type
CCLD	*Yes* *No*	Set to *Yes* for CCLD (Constant Current Line Drive) transducers, otherwise set to *No*. Set automatically for known *Microphone* Type. **Note:** Set Input to *Rear Socket*. The CCLD input at the Rear socket will automatically be enabled when selecting a transducer requiring CCLD input

Calibration History

Table C.3 *Calibration History parameters*

Parameter	Values	Comment
1. Calibration date & Time	*YYYY-MM-DD hh:mm:ss*	Initial
1. *Sensitivity*	Double	Initial mV/Pa
1. *Preamplifier ID No.*	Text string	Initial
1. *User*	Text string	Initial
1. *Input*	*Top Socket*, *Rear Socket*	Initial
1. *Calibration Type*	External,Internal	Initial
1. *Calibrator Serial No.*	Text string	Initial
1. *Comment*	Text string	Initial
1. 2250 Serial No.	Text string	Initial
2. Calibration date & Time	*YYYY-MM-DD hh:mm:ss*	
2. *Sensitivity*	Double	
2. *Preamplifier ID No.*	Text string	
2. *User*	Text string	
2. *Input*	*Top Socket*, *Rear Socket*	
2. *Calibration Type*	External,Internal	
2. *Calibrator Serial No.*	Text string	
2. *Comment*	Text string	
2. 2250 Serial No.	Text string	
:	:	:
N. Calibration date & Time	*YYYY-MM-DD hh:mm:ss*	Current
N. *Sensitivity*	Double	Current
N. *Preamplifier ID No.*	Text string	Current
N. *User*	Text string	Current
N. *Input*	*Top Socket*, *Rear Socket*	Current
N. *Calibration Type*	External,Internal	Current
N. *Calibrator Serial No.*	Text string	Current
N. *Comment*	Text string	Current
N. 2250 Serial No.	Text string	Current

Calibration Setup

Table C.4 *Calibration Setup parameters*

Parameter	Values	Comment
(Sound Level) *Calibrator*	*4231* *Custom*	Select which calibrator to use
Calibration Level (for Sound Level Calibrator Type 4231)	*0.00* to *200.00 dB* re 20 µPa	The *Calibration Level* will be automatically calculated for *Input* = *Top Socket*.The *Calibration Level* can be set manually in all other cases
Calibration Level (for Custom Sound Level Calibrator)	*0.00* to *200.00 dB* re 20 µPa	Set calibration level for custom calibrator
Serial No. for 4231	Text string	Serial number will be documented in calibration history
Serial No. for Custom Sound Level Calibrator	Text string	Serial number will be documented in calibration history

Appendix D

Preferences

This appendix describes the unique set of parameters that can be set for each user on the instrument.

Display Settings

Table D.1 *Colour Scheme parameters*

Parameter	Values	Comment
Colour Scheme	*Arcade* *Alhambra* *Indoor* *Outdoor* *Night*	Select between five colour schemes, one optimised for outdoor use in bright conditions and one optimised for very dark conditions

For each colour scheme select the optimum choice of brightness for the traffic light and whether the backlight for the pushbuttons should be on or off.

Table D.2 *Traffic Light and Backlight parameters*

Parameter	Values	Comment
Traffic Light Brightness	*Off* *Low* *Normal* *High*	
Key Backlight	*Off* *On*	

Table D.2 *Traffic Light and Backlight parameters*

Parameter	Values	Comment
Backlight Brightness	*Minimum* *Level 2* *Level 3* *Level 4* *Level 5* *Maximum*	Select backlight brightness using the backlight icon  at the bottom of the screen. Maximum level uses the most power

Power Settings

Table D.3 *Power Settings parameters*

Parameter	Values	Comment
Turn off Backlight	*After 10 sec.* *After 30 sec.* *After 1 min.* *After 2 min.* *After 5 min.* *Never*	Select optimum value for full backlight on (brightness determined by Backlight Brightness)
Turn off Backlight Dim	*After 1 min.* *After 2 min.* *After 5 min.* *After 10 min.* *After 30 min.* *Never*	Select optimum value for *Backlight Dim* period running after the *Backlight On* period has elapsed. The Backlight Brightness will be at Minimum in the dim period. When *Backlight Dim* period has elapsed, the backlight is switched off
Standby	*After 1 min.* *After 2 min.* *After 5 min.* *After 10 min.* *After 30 min.* *Never*	Select optimum value for 'on' period before the instrument is set automatically to standby

Note: If the instrument is externally powered, then the settings will be ignored.

Regional Settings

Table D.4 *Regional Settings parameters*

Parameter	Values	Comment
Decimal Point	. ,	Select your preferred decimal point
Date separator	- / .	Select your preferred date separator
Date Format	*yyyy-MM-dd HH:mm:ss* *dd-MM-yyyy HH:mm:ss* *MM-dd-yyyy HH:mm:ss* *yy-MM-dd hh:mm:ss XX* *dd-MM-yy hh:mm:ss XX* *MM-dd-yy hh:mm:ss XX*	Select your preferred date format: HH = 24 hour, hh = 12 hour, XX = AM or PM
Time Zone	*GMT-12* *GMT* *GMT+13*	Select the time zone of your region
Language	*English*, ...	17 different languages. Select your preferred language
Keyboard	*United Kingdom*, ...	33 different keyboards. Select your preferred keyboard

Storage Settings

Table D.5 *Storage Settings parameter*

Parameter	Values	Comment
Project Name Prefix	Text string	Prefix for automatically generated project name. Maximum 8 characters

Headphone Settings

Table D.6 *Headphone Settings parameters*

Parameter	Values	Comment
Listen to signal	*No* *Input A-weighted* *Input C-weighted* *Input Z-weighted*	In addition to the commentary annotations, you can listen to the input signal for monitoring purposes. Select one of the A-weighted, C-weighted or Z-weighted signals. **Note:** The frequency weighting of the signal you listen to can be selected independently of the frequency weighting of the measurement, the signal at the output socket and the signal used for sound recording
Automatic Gain Control	*On* *Off*	To ease identification of sound sources, the gain can be automatically adjusted to keep the average level within a 40 dB range. When playing back the recorded signal, you will then hear clearly the whole signal content, whether the level has been 20 dB or 140 dB. Set *Automatic Gain Control* to *On* to convert the signal at the headphone output. Set *Automatic Gain Control* to *Off* for listening to the signal with a fixed gain
Gain for Meas.Signal	*– 80.0 dB to 60.0 dB for Automatic Gain Control set to Off* *– 60.0 dB to 0.0 dB for Automatic Gain Control set to On*	Key in a gain value (0.1 dB resolution) for the measurement input signal. Use '@' to assign the new value for immediate response at the output – or use the up/down navigation keys to increment/decrement the value in steps of 1 dB. **Note:** 0 dB means 1 V output for 1 V input (*Automatic Gain Control* set to *Off*)

Table D.6 *Headphone Settings parameters*

Parameter	Values	Comment
Gain for Annotations	*– 94.5 dB to 0.0 dB*	Key in a gain value (1.5 dB resolution) for the commentary annotations. Use '@' to assign the new value for immediate response at the output – or use the up/down navigation keys to increment/decrement the value in steps of 1.5 dB

Note 1: While playing back an annotation, you can use the up/down navigations keys to increase/decrease the gain of the annotation.

Note 2: If you don't want to listen to the input signal, then set 'Listen to Signal' = *No*, to economise on power.

Users

Table D.7 *Users parameter*

Parameter	Values	Comment
Multi User	*Disabled* *Enabled*	Set to *Enabled* to enable the Multi-user facility, set to *Disabled* if you are the only user

Printer Settings

Table D.8 *Printer Settings parameters*

Parameter	Values	Comment
Printer Used	*None*	Select *None* if you don't have a printer connected to Type 2250.
	MPS	Select *MPS* for a Mobile Pro Spectrum thermal printer from AM-TECH.
	PCL	Select *PCL* for a printer accepting PCL printer language.
	PCL Inkjet	Select *PCL Inkjet* for an inkjet printer accepting PCL language.
	PCL Laser	Select *PCL Laser* for a laser printer accepting PCL language. See Chapter 8 for more details

Table D.8 *Printer Settings parameters*

Parameter	Values	Comment
Top Margin	*0.0 to 20.0 cm*	Use *Top Margin* to position the print on the paper
Left Margin	*0.0 to 20.0 cm*	Use *Left Margin* to position the print on the paper
Width	*1.0 to 15.0 cm*	Use *Width* to set the size of the print
Height	*1.4 to 20.0 cm*	Use *Height* to set the size of the print

Modem Settings

Table D.9 *Modem Settings parameter*

Parameter	Values	Comment
Modem	*Enabled* *Disabled*	Set to *Enabled* if you have a modem connected to the Compact Flash socket. Set to *Disabled* if you don't have a modem connected – or when you physically connect or disconnect the modem. See Chapter 8 for more details

Appendix E

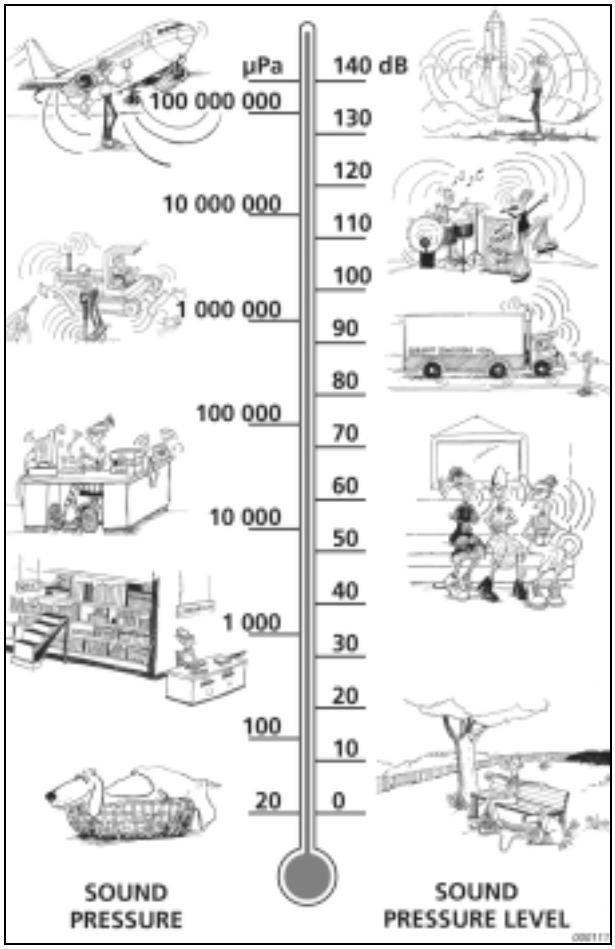
Glossary

A-weighting filter: Frequency weighting corresponding approximately to the 40 dB equal loudness curve, that is to say, the human ear's response at low to medium sound levels. It is by far the most commonly applied frequency weighting. See also ***C-weighting*** and ***frequency weighting***.

C-weighting filter: Frequency weighting corresponding to the 100 dB equal loudness curve, that is to say, the human ear's response at fairly high sound levels. Mainly used when assessing peak values of high sound pressure levels. See also ***A-weighting*** and ***frequency weighting***.

decibel (dB): The measurement unit for expressing the relative intensity of sound. A direct application of linear scales (in Pa) to the measurement of sound pressure leads to large and unwieldy numbers. As the ear responds logarithmically rather than linearly to stimuli, it is more practical to express acoustic parameters as a logarithmic ratio of the measured value to a reference value. This logarithmic ratio is called a decibel or dB. The advantage of using dB can be clearly seen in the below illustration. Here, the linear scale with its large numbers is converted into a manageable scale from 0 dB at the threshold of hearing (20 μPa) to 130 dB at the threshold of pain (~100 Pa).

Our hearing covers a surprisingly wide range of sound pressures – a ratio of over a million to one. The dB scale makes the numbers manageable



'F' time weighting:

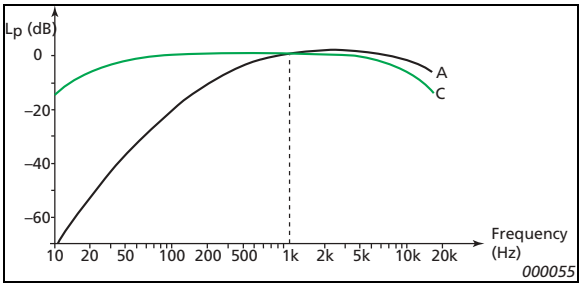
A time weighting (sometimes called a 'time constant') defines how the exponential averaging in root-mean-square (RMS) measurement is done. It defines how the heavily fluctuating sound pressure variations are smoothed or averaged to allow useful readings. The standards define three time weightings: F (Fast), S (Slow) and I (Impulse). Most measurements are carried out using the 'F' time weighting, which uses a 125 ms time constant.

frequency:

The number of pressure variations per second. Frequency is measured in hertz (Hz). The normal hearing for a healthy young person ranges from approximately 20 Hz to 20000 Hz (20 kHz).

frequency weighting:

Our hearing is less sensitive at very low and very high frequencies. In order to account for this, weighting filters can be applied when measuring sound. The most commonly used weighting is the 'A-weighting', which approximates the human ear's response to low – medium noise levels. A 'C-weighting' curve is also used, particularly when evaluating very loud or very low-frequency sounds.



L_{Aeq}:

A widely used noise parameter that calculates a constant level of noise with the same energy content as the varying acoustic noise signal being measured. The letter 'A' denotes that the A-weighting has been included and 'eq' indicates that an equivalent level has been calculated. Hence, L_{Aeq} is the A-weighted equivalent continuous noise level.

L_{AF}:

The instantaneous time-weighted sound level. 'A' denotes that the A-frequency weighting is used. 'F' denotes that the Fast time-weighting is used.

L_{AFmax}:

Maximum time-weighted sound level measured with A-frequency weighting and Fast time weighting. It is the highest level of environmental noise occurring during the measurement time. It is often used in conjuction with another noise parameter (for example L_{Aeq}) to ensure a single noise event does not exceed a limit.

L_{Cpeak}:

Maximum peak sound level during a measurment. The 'C' frequency weighting is applied. Used for assessing possible damages to human hearing caused by very high short-duration noise levels.

SIL, PSIL:

SIL (Speech Interference Level) is the average of the 500 Hz, 1 kHz, 2 kHz and 4 kHz octave band levels.
PSIL (Preferred Speech Interference Level) is the average of the 500 Hz, 1 kHz and 2 kHz octave band levels.
Used for evaluating the interference of noise upon speech communication.

sound: Any pressure variation that the human ear can detect. Just like dominoes, a wave motion is set off when an element sets the nearest particle of air into motion. This motion gradually spreads to adjacent air particles further away from the source. Depending on the medium, sound extends and affects a greater area (propagates) at different speeds. In air, sound propagates at a speed of approximately 340 m/s. In liquids and solids, the propagation velocity is greater – 1500 m/s in water and 5000 m/s in steel.

Sound level or sound pressure level: The level in decibels of the pressure variation of a sound. See also **decibel**.

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