MADSEN Itera II

MADSEN Itera II

User Manual

CE 0459

Doc no. 7-50-0860/12

otometrics
MADSEN · AURICAL · ICS

Copyright notice

No part of this Manual or program may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written consent of GN Otometrics A/S.

Copyright© 2009, GN Otometrics A/S

Printed in Denmark by GN Otometrics A/S, Denmark

All information, illustrations, and specifications in this manual are based on the latest product information available at the time of publication. GN Otometrics A/S reserves the right to make changes at any time without notice.

Technical support

Please contact your supplier.

Table of Contents

MADSEN Itera II

User Manual

1 Introduction to MADSEN Itera II and the OTOsuite Audiometry Module 9

1.1 MADSEN Itera II 9
1.2 The Audiometry Module 10
1.2.1 OTOsuite Audiometry Module interfacing to audiometers 11
1.3 Intended use 11
1.3.1 MADSEN Itera II 11
1.3.2 The Audiometry Module 11
1.4 About this manual 11
1.5 Typographical conventions 12
1.5.1 Navigation in this manual 12

2 Getting started with MADSEN Itera II and the OTOsuite Audiometry Module 13

2.1 Unpacking Itera II 13
2.2 Getting started 13
2.3 Customization 15
2.3.1 Customizing your Setup 15
2.3.2 Shortcuts 15

3 Overview of MADSEN Itera II 17

3.1 Display 17
3.2 FRONT panel controls 19
3.2.1 Front panel layout 20
3.2.2 The TEST column 21
3.2.3 The TRANSD. column (transducers) 21
3.2.4 The SIGNAL column 22
3.2.5 The MIC, CD and REVERSE column 23
3.2.6 The OUTPUT test signal indicators 23
3.2.7 The ERASE button 23
3.2.8 The XMIT button 24
3.2.9 The MIC. (microphone) 24
3.2.10 The TALK OVER button 24
3.2.11 The RESPONSE indicator 25
3.2.12 The START/STOP button 25
3.2.13 The STORE button 26
3.2.14 The EXT. RANGE button 26
3.2.15 The L <--> R button 27
3.2.16 The SETUP button 27

3.2.17 The TALK BACK button 28
3.2.18 The MASK column 28
3.2.19 The dB STEP column 29
3.2.20 The FREQUENCY knob 29
3.2.21 dB - LEVEL - Left 30
3.2.22 dB - LEVEL - Right 30
3.2.23 Left INT button (FAIL) 31
3.2.24 Right INT button (PASS) 31
3.3 Socket connections - rear panel 31
3.3.1 Description 32
3.4 Side panel 34

4 Navigating in the OTOsuite Audiometry Module 35

4.1 Audiometry Module features 35
4.2 The Audiometry Module menu system and toolbar 36
4.3 The Audiometry Module Control Panel 39
4.3.1 The MADSEN Itera II Control Panel 40
4.4 The stimulus bar 42
4.4.1 The Tone stimulus bar 44
4.4.2 The Speech stimulus bar 44
4.5 The Tone test screen 45
4.5.1 The work area in the Tone screen - the audiogram 45
4.5.2 Tone view options 46
4.5.3 The Legend box 48
4.6 The Speech test screen 48
4.6.1 The work area in the Speech screen 48
4.6.2 The Legend box 50
4.6.3 Terms and abbreviations used in Speech testing 50
4.7 The Aided Speech test screen 51
4.8 The Patient Responder indicator 51
4.9 Curves and symbols selection 52
4.9.1 Selecting a symbol or curve 52
4.9.2 Creating new symbols 53
4.10 The Masking Assistant 54

5 Preparing MADSEN Itera II for the test 59

5.1 Preparing the test environment 59
5.1.1 Hygienic precautions 59
5.2 Preparing the test equipment 59
5.2.1 Connecting the cables of the test equipment 59
5.2.2 The patient response switch 60
5.2.3 Preparing for air conduction testing 60
5.2.4 Preparing for bone conduction testing 61
5.2.5 Preparing for testing with masking 62
5.3 Free-field 62

5.4 Preparing the Audiometry Module for testing 63
5.5 Fetch test results from audiometer 63
5.6 Preparing the patient for testing 63

6 Tone Testing with MADSEN Itera II 65
6.1 Air Conduction threshold test 65
6.1.1 Prerequisites 65
6.1.2 Testing 65
6.1.3 Sound Field testing 67
6.2 Bone Conduction threshold test 67
6.2.1 Prerequisites 67
6.2.2 Testing 68
6.3 Testing with masking 69
6.3.1 When is masking required? 69
6.3.2 Air conduction with masking 72
6.3.3 Bone conduction with masking 73
6.4 Storing thresholds 74

7 Speech Audiometry with MADSEN Itera II 75
7.1 Monaural Speech Test 75
7.1.1 Selecting input 75
7.1.2 Selecting masking for speech audiometry 77
7.1.3 The counter function in speech audiometry 78
7.1.4 Interrupting the speech signal 78
7.2 Binaural Speech Test 78
7.2.1 One-channel or two-channel Speech testing 79
7.2.2 Adjusting input sensitivity 79
7.3 Special Speech routing 80
7.3.1 Mixing input signals for two-channel monaural Speech 80
7.3.2 Speech in Noise 80
7.3.3 Binaural Speech with masking 81
7.3.4 Masking level for Binaural Speech 82

8 Special tests with MADSEN Itera II 83
8.1 MCL tone testing 83
8.2 UCL tone testing 83
8.3 SISI Test 83
8.3.1 Masking during SISI 85
8.3.2 Using STORE in the SISI test 85
8.4 ABLB (Fowler) 86
8.4.1 Using STORE in the ABLB (Fowler) test 87
8.5 STENGER Test 87
8.6 Hearing Instrument Simulation (HIS) 88
8.6.1 The HIS procedure 89

8.6.2 Viewing thresholds and filters 92
8.6.3 Manually adjusting the HIS filters 93
8.7 Overview of Monaural/Binaural Test signals and the Masking side 96

9 Managing Data and Results 97
9.1 Transferring test results from the audiometer to the PC 97
9.2 Storing data 97
9.3 Printing results 97

10 Setup of MADSEN Itera II Parameters 99
10.1 What does SETUP do? 99
10.2 How to use SETUP 99
10.2.1 Permanent changes in the setup 99
10.2.2 Return to default settings 100
10.2.3 Temporary changes in the setup 100
10.3 SETUP items 101

11 Configuring OTOsuite 115
11.1 Audiometry 116

12 MADSEN Itera II Maintenance and Safety 123
12.1 Service and repair 123
12.2 Cleaning and maintenance 123
12.2.1 Cleaning the device 123
12.2.2 Cleaning accessories 124
12.2.3 Replacing fuses 124
12.3 Calibration 124

13 Unpacking and Installing MADSEN Itera II 127
13.1 Unpacking Itera II 127
13.2 Installation 127
13.2.1 Location 127
13.2.2 Air conduction 128
13.2.3 Bone conduction 128
13.2.4 External microphone 129
13.2.5 Free Field 130
13.2.6 Powering 131
13.2.7 Connecting to a PC 131
13.2.8 Firmware update - audiometers 131

App. 1 Maximum Non-Destructive Voltage - MADSEN Itera II 133
App. 1.1 Input and output sockets 133
App. 1.2 RS232 interface sockets 133

App. 2 MADSEN Itera II Abbreviations 135

App. 3 Technical Specifications - MADSEN Itera II 139

App. 3.1 Accessories 139
App. 3.2 Technical Specifications 139

App. 4 Standards and safety - MADSEN Itera II and the Audiometry Module 145

App. 4.1 MADSEN Itera II 145
App. 4.1.1 Symbols used 145
App. 4.1.2 Warning notes 145
App. 4.2 The OTOsuite Audiometry Module 147
App. 4.2.1 Manufacturer 147
App. 4.2.2 Responsibility of the manufacturer 147

Index 149

1 Introduction to MADSEN Itera II and the OTOsuite Audiometry Module

1.1 MADSEN Itera II

MADSEN Itera II is capable of performing all standard audiometer tests, speech audiometry and, depending on the configuration, various special tests such as SISI, Stenger, ABLB (Fowler), and HIS.

Itera II can be used as a portable instrument or as a desktop unit (fixed installation).

Itera II connects to PCs running theOTOsuite Audiometry Module for online monitoring of test results, data export and storage, printing, and NOAH compatibility.

Operation

Operation is simple and intuitive. The front panel buttons have indicator lights, which clearly show the device's current setting. Sound level, frequency and other information are clearly displayed on the display.

Speech input signals can be taken from a CD player, tape recorder and internal or external microphones. The masking signal for speech audiometry can be presented together with the speech signal for the ear being examined - "Speech in Noise".

The MADSEN Itera II can be used in connection with the OTOsuite Audiometry Module for monitoring of test results, data export and storage, printing and NOAH compatibility.

Output options

There are three output options:

- standard headphones (AC),
- bone conductors (BC)
- special output (SF), which can be connected for instance to a free-field loudspeaker or insert phone (see available output in 5 SF TRANSDUCER ▶ 103).

Itera II can be calibrated for several types of headphones simultaneously.

Transferring data to and from a pc

The test results are stored in the device - even when it is switched off. The results can be transferred to a PC and displayed in OTOsuite (see 9 Managing Data and Results ▶ 97).

You can download new firmware to Itera II, and if this involves no change to the transducers, Itera II does not need to be recalibrated.

1.2 The Audiometry Module

The OTOsuite Audiometry Module software provides a comprehensive overview of the current stimulus and masking choices both numerically and graphically in the displayed audiogram(s) while testing with a connected Otometrics audiometer.

As the module is part of OTOsuite, audiograms can be used directly in other OTOsuite modules such as AURICAL Visible Speech for an optimized workflow independent of NOAH.

The OTOsuite Audiometry Module lets you work with NOAH or save and view results via XML files.

The current version supports

- basic tone audiometry and
- speech testing
- special tests, depending on the audiometer being used.

Masking Assistant™

The special Masking Assistant™ feature will notify you of thresholds that you might consider checking again with masking applied. You may use this feature not only during testing but also to pinpoint possible masking issues with previously recorded audiograms. The applied masking rules match the general recommendations in the audiometry literature.

Over the rim testing

Testing with the audiometer connected to a PC allows you to use the audiometer primarily as a handy control panel while you follow the actual stimulus settings and test progress on your standard PC display. The large stimulus and patient response graphics at the top of the display gives you a clear overview while keeping your focus on the patient.

Patient test planning

The OTOsuite Audiometry Module supports planning of patients for safe offline testing in the field. You create a list of patients that can then be downloaded to audiometers supporting patient planning (MADSEN Xeta). Each planned patient can

now be safely identified, selected and tested on the audiometer based on his name and personal identification. The results can be bulk uploaded to the PC later on.

For specific information regarding audiometric test procedures and settings, please see the documentation for the specific audiometer.

1.2.1 OTOsuite Audiometry Module interfacing to audiometers

The OTOsuite Audiometry Module is designed to interface with the following test devices produced by Otometrics

Audiometers produced by Otometrics:

- MADSEN Xeta (Air, Bone, Masking)
- MADSEN Itera II (Air, Bone, Masking, Speech)
- MADSEN Astera (Air, Bone, Masking, Speech, special tests)
- AURICAL Plus and MADSEN Conera (download of data via LINK).

1.3 Intended use

1.3.1 MADSEN Itera II

Itera II is intended for diagnostic and clinical use by audiologists and other health care professionals in testing the hearing of their patients.

1.3.2 The Audiometry Module

The OTOsuite Audiometry Module is intended for screening and diagnostic use by audiologists and other health care professionals in testing the hearing of their patients.

1.4 About this manual

Installation
See 13 Unpacking and Installing MADSEN Itera II ▶ 127 and 3 Overview of MADSEN Itera II ▶ 17 for a full description of unpacking instructions, controls and socket connections.

Safety
This User Manual contains information and warnings which must be followed to ensure the safe performance of Itera II.

Warning · *Local government rules and regulations, if applicable, should be followed at all times.*

- App. 4 Standards and safety - MADSEN Itera II and the Audiometry Module ▶ 145
  gives you an overview of device labelling and standards.
- App. 4.1.2 Warning notes ▶ 145
  contains relevant warning notes.

Training
It is recommended that you read this manual and the OTOsuite Platform User Manual, and make yourself familiar with Itera II before you begin testing a patient.

Note · *If you are using the OTOsuite Audiometry Module with NOAH 3, we recommend that you are familiar with the screens and functions provided in NOAH 3.*

Terminology
The correct term for the person being tested/evaluated/serviced may depend on the setting in which the system is being used. For this manual the term "Patient" was chosen, but when you use Itera II with OTOsuite, you can configure OTOsuite to use another term.

1.5 Typographical conventions

The use of WARNING, CAUTION and NOTE
For safety reasons and appropriate use of the OTOsuite Audiometry Module, the manual contains **WARNINGS**, **CAUTIONS** and **NOTES**, which you should read carefully. The use of these headings is denoted as follows:

Warning · *Indicates that there is a risk of danger to persons and data.*

Caution · *Indicates that there is a risk of damage to data.*

Note · *Indicates that you should take special notice.*

1.5.1 Navigation in this manual

Menus, icons and functions to select are shown in bold type, as for instance in:

- Click the **Set options** icon on the toolbar or select **Tools > Options...**

2 Getting started with MADSEN Itera II and the OTOsuite Audiometry Module

2.1 Unpacking Itera II

1. Inspect the package and its contents for possible visual damage.
2. Check with the packing list to make sure that you have received all necessary parts and accessories. If your package is incomplete, contact your supplier.

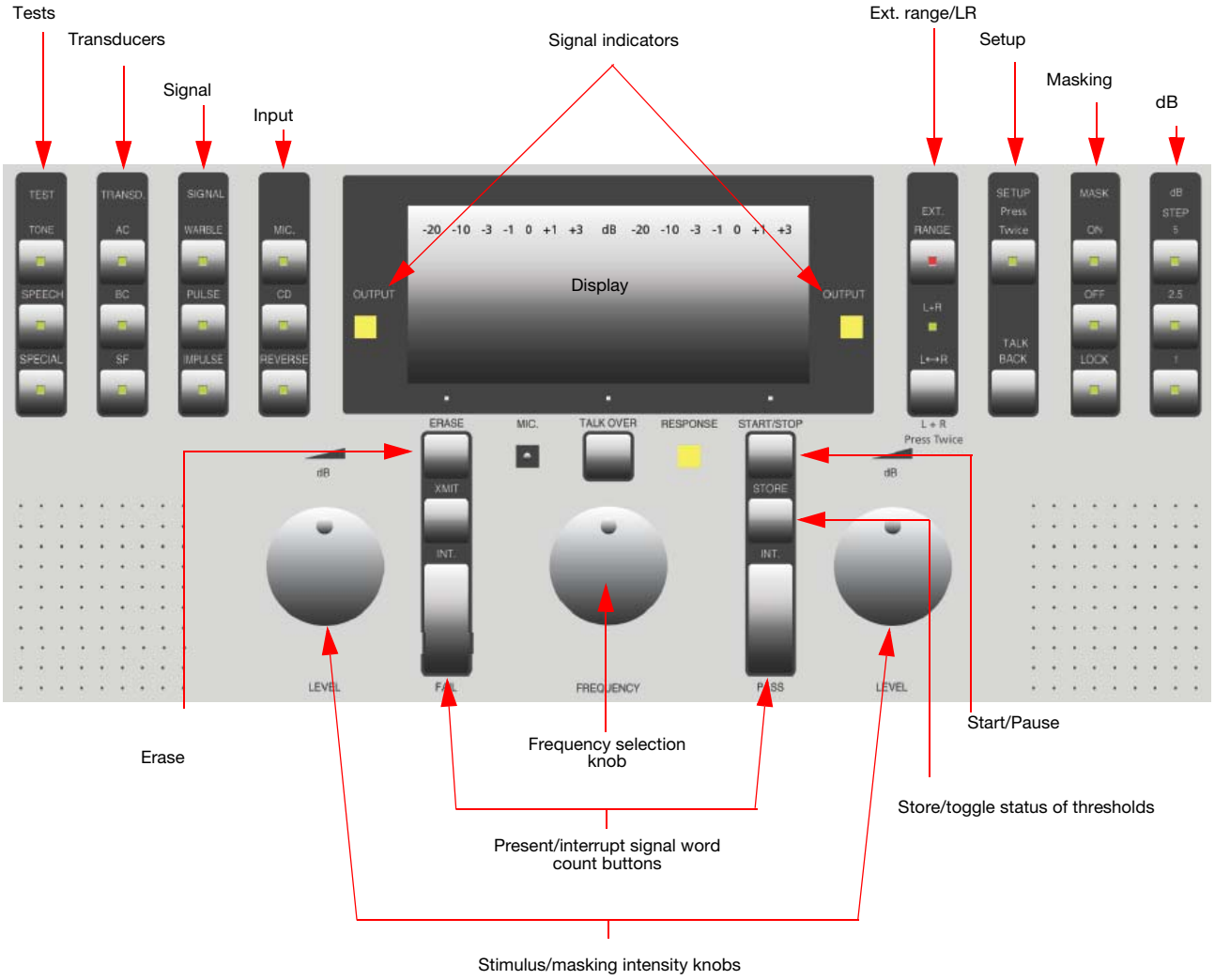
2.2 Getting started

1. If you are using OTOsuite, install OTOsuite from the OTOsuite Installation CD. See the OTOsuite User Manual.
2. Install Itera II as described in 13 Unpacking and Installing MADSEN Itera II ▶ 127.
3. Connect the accessories, 13.2 Installation ▶ 127:
   - Connect the Patient Response Switch.
   - Connect headphones/insert phones.
   - If bone conduction is required, connect the bone conductor.
   - Connect external and Free Field microphones if required.

   3.3 Socket connections - rear panel ▶ 31 shows the location of the sockets for the various accessories required.
4. Customize and prepare the test equipment:
   - 2.3 Customization ▶ 15
   - 5 Preparing MADSEN Itera II for the test ▶ 59
5. Switch on Itera II. Itera II is ready for testing as soon as it is switched on.
6. Launch the OTOsuite Audiometry Module, if required.
7. Itera II automatically starts in manual test mode.
8. You are ready to start testing.

Itera II controls

3.2 FRONT panel controls ▶ 19



Test types

- **Manual air conduction testing**
  To perform manual air conduction testing, see 6.1 Air Conduction threshold test ▶ 65.
- **Bone conduction testing**
  To perform bone conduction testing, see 6.2 Bone Conduction threshold test ▶ 67.
- **Speech testing**
  To perform speech testing, see 7 Speech Audiometry with MADSEN Itera II ▶ 75.
- **Special tests**
  8.1 MCL tone testing ▶ 83
  8.2 UCL tone testing ▶ 83

8.3 SISI Test ▶ 83,
8.4 ABLB (Fowler) ▶ 86,
8.5 STENGER Test ▶ 87,
8.6 Hearing Instrument Simulation (HIS) ▶ 88

Press **SPECIAL**. Three special tests will be shown on the display.

Press the function key below the test you wish to perform. If your Itera II is configured with more than three special tests, press **SPECIAL** until you see the test you wish to use.

These tests are optional. To add any of these tests to your configuration, contact your local supplier.

2.3 Customization

With Itera II you can quickly and easily customize your test sequences for maximum efficiency.

2.3.1 Customizing your Setup

Make the changes you want in the setup of Itera II and save these changes in the specific test setup.

Example

1. Set dB STEP to 1 dB (press button **1** in the **dB STEP** column).
2. Press **SETUP** twice to enter setup mode.
3. Turn the **Left dB LEVEL** knob until **"SAVE TEST SETUP"** is shown on the display.
4. Press **STORE**.
5. Turn Itera II off and then on again. It now remembers your preferred settings.

2.3.2 Shortcuts

A number of functions in Itera II can be activated by a shortcut so that you just have to press and hold the appropriate button and turn the knob.

For a full list of shortcuts, see 10.2.3 Temporary changes in the setup ▶ 100.

Example

1. Press the **SPEECH** button to select Speech mode.
2. Press **MIC** to select microphone.
3. Press and hold **MIC** while you turn the **right LEVEL** knob. You will then adjust the sensitivity of this microphone.

3 Overview of MADSEN Itera II

Display
Settings and the test as it progresses are shown on the display. See 3.1 Display ▶ 17.

Front panel
Itera II is operated from the front panel. See 3.2 FRONT panel controls ▶ 19.

Rear panel connections
The rear panel contains the sockets for connecting various accessories and the socket for power connection. See 3.3 Socket connections - rear panel ▶ 31.

Side panel
The side panel contains the ON/OFF switch. See 3.4 Side panel ▶ 34.

3.1 Display

The display is placed in the top center of the front panel.

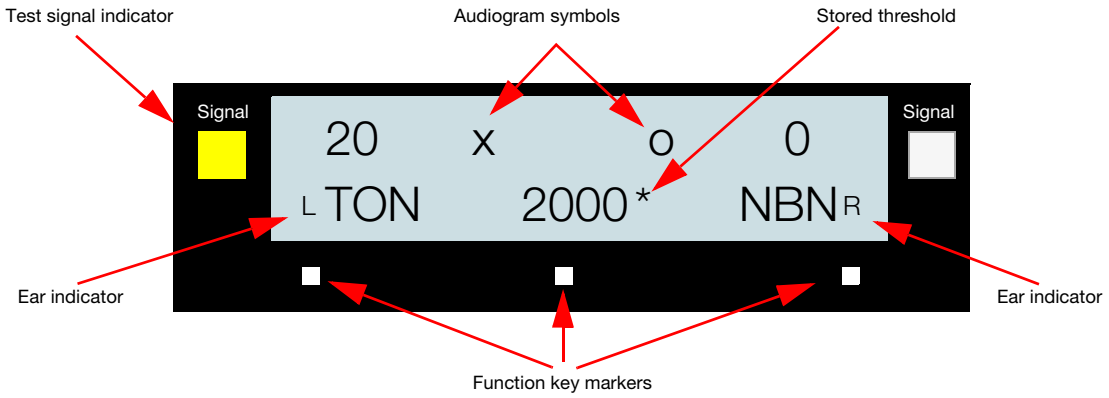


Fig. 1 Itera II front panel

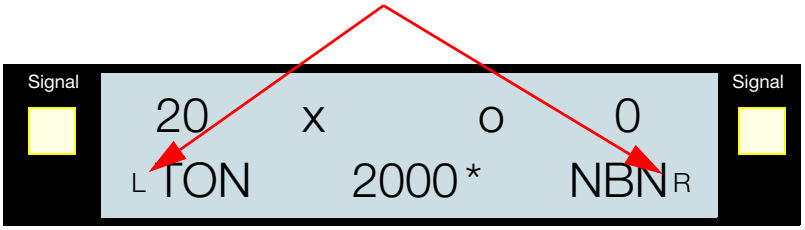
During startup the display briefly shows information regarding the device type and version, and then shows the test screen last used.

The abbreviations used on the display are explained in App. 2 MADSEN Itera II Abbreviations ▶ 135.

Top line

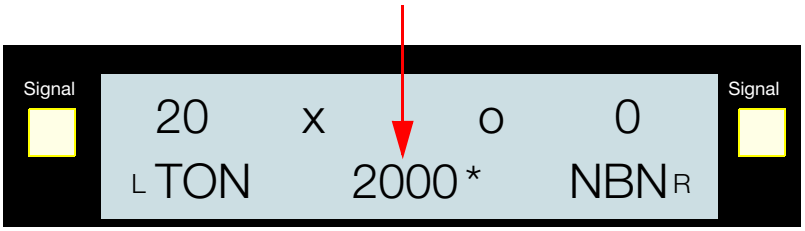
- During Tone testing the upper line in the display shows the intensity numerically in dB HL for the left and right ear.
- For Speech testing and HIS the upper line is transformed into one or two VU meters.

Ear selection



The ear being tested is indicated with **L** or **R** in the display. The display side for **L** and **R** can be changed in the settings. See 36 DISPLAY ▶ 111.

Frequency



The selected test frequency for tone testing is shown at the center.

Masking

If masking for the contralateral ear is enabled, this is shown on the opposite side.

Symbols used

Right ear Resp./No resp.		Left ear Resp./No resp.		
				Air, unmasked
				Air, masked

Right ear Resp./No resp.		Left ear Resp./No resp.		
				Bone, unmasked
				Bone, masked
				Sound field, unmasked (binaural - applies to both ears)
				Sound field, masked
				UCL (UnComfortable Loudness level)
				MCL (Most Comfortable Loudness level)

Other symbols	
	Stored results on this frequency

3.2 FRONT panel controls

You can access all basic functions directly by using the buttons and knobs on the Itera II front panel.

The button light indicators

Each button has its own function. Some buttons have a light to indicate whether the function is currently active or not.

- Press the button to activate.
- Press the button again to deactivate.

3.2.1 Front panel layout

The Itera II buttons and controls are grouped according to their function and how frequently they are used. The layout is shown in Fig. 2 ▶ 20.

The buttons and knobs most frequently used are placed directly below the display.

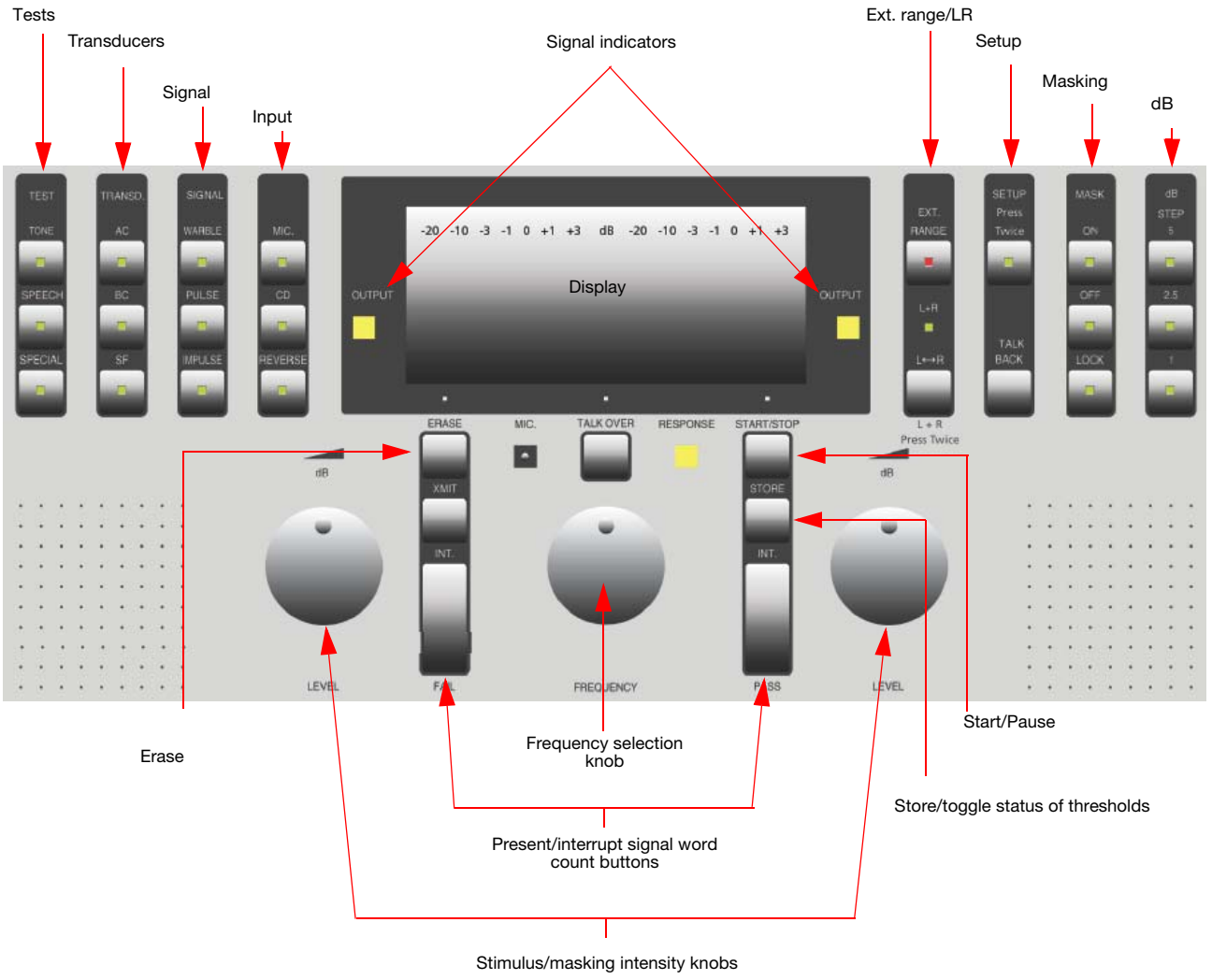


Fig. 2 The Itera II controls and display

Beep

If you try to use a button which is not enabled, you will hear two short beeps. Itera II also beeps when the SISI test is completed.

3.2.2 The TEST column

Press to select the test:

- **TONE**
  Press **TONE** to select the Tone Threshold test.
- **SPEECH**
  Press **SPEECH** to select the Speech test.
- **SPECIAL**
  Press **SPECIAL** to see the optional test types. Press the appropriate function key to select. On versions of Itera II supplied with more than three special tests, press **SPECIAL** again while its LED is flashing. This will display the names of more Special tests.

  The most recently used Special test always appears in the first row the next time you select **SPECIAL**.

  For a description of the special tests, see

  – 8.1 MCL tone testing ▶ 83
  – 8.2 UCL tone testing ▶ 83
  – 8.3 SISI Test ▶ 83
  – 8.4 ABLB (Fowler) ▶ 86
  – 8.5 STENGER Test ▶ 87
  – 8.6 Hearing Instrument Simulation (HIS) ▶ 88

Current test settings
When you switch to a new test, the current setting of the test that you are leaving will be saved and re-established when you return to the test.

3.2.3 The TRANSD. column (transducers)

Press to select the output transducer:

- **AC**
  Press **AC** to select the Air Conductor
- **BC**
  Press **BC** to select the Bone Conductor
- **SF**
  Press **SF** to select the Special Transducer

The identity of the transducer selected under **SETUP** is displayed as long as you press the button.

If a headphone/transducer is not selected under **SETUP**, 3 AC TRANSDUCER ▶ 102, 4 BC TRANSDUCER ▶ 102 and 5 SF TRANSDUCER ▶ 103, the relevant transducer cannot be selected.

3.2.4 The SIGNAL column

WARBLE
Presentation of warble tone stimulus (WRB).

Warble shortcut functions	
Warble frequency	To change the warble frequency, press and hold **WARBLE**, while you turn the **left LEVEL** selector.
Warble modulation	To change warble modulation width, press and hold **WARBLE**, while you turn the **right LEVEL** selector.

PULSE
The test signal is presented with a Pulse/Pause ratio of 50%.

Pulse shortcut functions	
Pulse frequency	To change the pulse frequency, turn the **right LEVEL** selector while you press and hold **PULSE**.

IMPULSE
The test signal is presented within a preset period of time.

Impulse shortcut functions	
Test signal duration	To change the duration of the test signal, turn the **right LEVEL** selector while you press and hold **IMPULSE**.

3.2.5 The MIC, CD and REVERSE column

MIC.
Press **MIC.** to select the signal from external or internal microphone input. The internal microphone is located below the display. External microphones are for instance the gooseneck microphone, or, if you are using a monitor headset, the boom microphone.

CD.
Press **CD** to select the signal from external CD/TAPE input.

MIC/CD shortcut functions	
Input signal sensitivity, MIC/CD	You can adjust the input signal sensitivity by holding down the **MIC** or **CD** button and turning the **LEVEL** selector that is closest to the test signal side.

REVERSE
Press **REVERSE** to toggle the function of the Interrupter between:

- **REVERSE** (lamp lit)
  If **REVERSE** is on (the test signal is activated continuously), the test signal is interrupted when you press **INT**.
- **Normal**
  The test signal is applied when you press **INT**.

Note · *The presentation only applies to the test signal. The masking signal is normally always ON. You can change the masking interrupter's function under* **SETUP**, *9 MASK. PRESENT. ▶ 103.*

The permitted signal source depends on the **TEST** selected, see 3.1 Display ▶ 17.

Speech and HIS
- Press **REVERSE** to toggle the signal.

3.2.6 The OUTPUT test signal indicators

The OUTPUT indicators are located on either side of the display. They light up when the selected test signal is present in the corresponding ear.

3.2.7 The ERASE button

This button has several functions:

Deleting all audiogram data
You must delete all data before you start testing on a new patient.

- Press **ERASE** to clear all data.
  The following dialog appears :

  Erase all data ?
  YesNo

  To delete all data, press the function key below YES.

  To cancel the ERASE command, press the function key below NO.

Note · *Switching off the power does not erase stored thresholds from the memory.*

Additional functions

- Speech Audiometry and many special tests:
  Various counter values: **Press** to reset to zero.
  See the description of • SPECIAL ▶ 21, and 8 Special tests with MADSEN Itera II ▶ 83),

- SISI:
  Press to stop test completely during the pause.
  Press to delete data at a specific frequency if it is activated during a test (see 8.3 SISI Test ▶ 83).

3.2.8 The XMIT button

This button is not active.

3.2.9 The MIC. (microphone)

The internal microphone for Talk Over and Speech testing.

Use this microphone as an alternative to the gooseneck microphone or the boom microphone on the monitor headset.

3.2.10 The TALK OVER button

Enables communication with the patient who may be sitting in a sound booth. The signal from the internal microphone or the right Speech microphone is sent to the patient's headset while the button is pressed.

The test signal and any masking signal is interrupted during this period.

When you release the button the test signal returns.

Shortcut functions
When you press and hold **TALK OVER** (see 25 TALK OVER ▶ 110), you can adjust the following:

Talk over shortcut functions	
Output level, headphone	**Left LEVEL selector** Adjusts the output level in the headphone (dB HL).
Fixed dB level, talkover level	**Frequency selector** Switches between the fixed dB level (FIX) displayed and a talkover level related to a mean of the saved thresholds (THR) for the following frequencies: 250, 500, 1000, 2000 and 4000 Hz.
MIC sensitivity	**Right LEVEL selector** Sets Mic sensitivity.
Talkover signal to headphone	**Left/Right arrow button** Controls the Talk Over signal to the right or left headphone. Press twice to transmit the signal to both ears.

The change-over from "INTERN." to "EXTERN." occurs automatically if an external microphone is connected (see Fig. 3 ▶ 32).

3.2.11 The RESPONSE indicator

Lights up when the patient presses the Patient Response switch. You will hear a “beep” at the same time.

For a description of the Patient Response Switch, see 5.2.2 The patient response switch ▶ 60.

3.2.12 The START/STOP button

Press to **Start**, **Stop** or **Pause** the counter/timer function in different tests as required.

- SISI
  Press to **Start**/**Stop** and **Pause**.
- HIS
  Press to activate the filters.

3.2.13 The STORE button

Stores a threshold in the internal memory. This button is not applicable in Speech testing.

- If you press and hold **STORE**, it toggles the threshold status and symbol shown on the display between “threshold value”, “No response” or no symbol. Release the button when it shows the wanted status.
  You can overwrite a stored threshold value with a new value.

  You can delete an accidentally stored threshold: Press and hold **STORE** until no symbol is shown.

Note · *In UCL and MCL testing*
“No response” is not applicable.

- If a previously stored threshold is present, it will be replaced by the new threshold when you press **STORE**.

Change frequency after STORE
You can set up the **STORE** button to automatically change the stimulus to the next test frequency. See **SETUP**, 13 FREQ.CH.AT STORE ▶ 104.

When you select a frequency and intensity at which a threshold value has previously been found, this value is shown in the display by means of an "*" symbol beside the frequency indication, and the applicable audiogram symbol beside the level indication, depending on the selection of ear, masking and transducer type.

3.2.14 The EXT. RANGE button

Enables presentation of stimuli above the safety limit (approx. 100 dB). The safety limit is set to 20 dB below the maximum dB HL for a given transducer and frequency. The exception is at 125 Hz, where the limit is 30 dB below the maximum dB HL.

Extended Range has three modes (to select, see **SETUP**, 32 EXT. RANGE ▶ 111):

- **Auto**
  All levels at all frequencies are always accessible, but the **EXT. RANGE** button is lit when a level above the safety limit is reached.
- **Manual**
  You must manually press the **EXT. RANGE** button to test above the safety limit.
- **Timeout**
  Selection of the time interval that passes between the device standing untouched and the EXTended (sound intensity) RANGE is deactivated.

EXT. RANGE is automatically *disabled*:

- when the intensity falls below the limit selected under **SETUP** 33 EXT.R. dB-SPACE ▶ 111,
- when the duration set for Ext. Range Timeout is exceeded and the device has been inactive (**SETUP**, 32 EXT. RANGE ▶ 111),
- when you select a new test, or
- when you change FREQUENCY, see 3.2.20 The FREQUENCY knob ▶ 29.

3.2.15 The L <--> R button

- Press this button to switch between testing the left and right ear.
- Speech test
  Press twice (**L+R**) during the speech test to send the test signal to both ears, giving "Binaural Speech".
  Use **L <--> R** to mix the signals in speech testing.

  Use **L <--> R** to control setup masking in one ear in binaural speech testing.

3.2.16 The SETUP button

Changing the setup temporarily
To change the setup of Itera II temporarily:

- Use the *Shortcut* function. See 10.2.3 Temporary changes in the setup ▶ 100. These changes will not be saved when you switch off Itera II.

Changing the setup permanently
To change the setup of Itera II permanently:

Use the **SETUP** button to access the various parameters. See 10.2.1 Permanent changes in the setup ▶ 99.

1. Press **SETUP twice** to change default settings, see 10 Setup of MADSEN Itera II Parameters ▶ 99.
   Pressing **SETUP twice** to access the setup function serves to prevent accidental changes in the setup.

   – SISI
   Press **SETUP** to enable the number of small increments to be changed using the **right LEVEL** selector.
   – Fowler (ABLB)
   Press **SETUP** to enable changing the frequency of the alternating tone using the **right LEVEL** selector.

3.2.17 The TALK BACK button

The patient's speech is always fed back to the operator's monitor headphone.

You can remove the signal

- by lowering the Talk Back volume (**SETUP**, 26 TALK BACK MIC. ▶ 110), or
- by setting the switch on the Talk Back microphone to OFF.

You can choose to have the test signal and/or the masking signal switched ON or OFF in the monitor headphone (**SETUP**, 27 MONITOR ON/OFF ▶ 110).

Talk back shortcut functions	
Setup - volume	To adjust the volume, press and hold **TALK BACK** while turning the **right LEVEL** selector.

3.2.18 The MASK column

OFF
No masking

ON
To adjust the masking intensity independently of the signal level use the **right LEVEL** selector.

LOCK
Makes the masking level follow the stimulus signal level. You can adjust the difference between the stimulus signal and the masking signal by using the **right LEVEL** selector.

Note · *By default, you can only adjust the test signal volume by using the* **LEFT** *selector, regardless of whether you are testing the right or left ear.*

To adjust the masking signal volume use the **RIGHT** selector. To change the default setting, select **SETUP**, 37 STIMULI KNOB ▶ 112.

MASK shortcut functions	
Masking transducer selection	When masking is already selected and you press the same masking button once more, the masking transducer, the masking signal type and the name of the transducer + (if applicable) the serial no. appear in the display. The transducer button flashes and you can then select a different masking transducer by pressing one of the three **TRANSD** buttons **AC**, **BC** or **SF**.
Masking noise in Speech	Select the masking ear: press and hold **MASK ON** and press **L <--> R** to toggle between left, right and both ears.

3.2.19 The dB STEP column

Choose between the following attenuator steps:

1 dB
2.5 dB
5 dB

If the indicator light on the selected button flashes, this indicates that the display has been set up to show SPL values (**SETUP**, 22 SIGNAL UNIT ▶ 109) instead of HL.

3.2.20 The FREQUENCY knob

Change of frequency.

When you turn the knob clockwise, the frequency is increased and when you turn the knob counter-clockwise, the frequency is decreased.

Both octave and inter-octave frequencies are available when you use the **Frequency** knob. The exception is 125 Hz, which follows the setting in **SETUP**, 20 SELECT AC FREQ. ▶ 109

FREQUENCY shortcut functions	
Display graphs, HIS mode	If you turn this knob in HIS mode, various graphs will be shown (see 8.6 Hearing Instrument Simulation (HIS) ▶ 88).

3.2.21 dB - LEVEL - Left

Intensity change
Changes the intensity for the test signal regardless of whether the signal is being sent to the left or right ear! To change this setting, select **SETUP**, 37 STIMULI KNOB ▶ 112.

When you turn the knob clockwise, the intensity is increased and when you turn the knob counter-clockwise, the intensity is decreased.

Masking and intensity
If the masking signal is in **LOCK** mode the intensity is also changed here.

Shortcut functions

dB LEVEL left - shortcut functions	
Warble modulation	Select the warble frequency,.
Signal type, SISI	The signal type for the SISI test.
Master volume, HIS	The master volume value to be changed in HIS.
Parameter selection, SETUP	Parameter selection in **SETUP**.

3.2.22 dB - LEVEL - Right

Intensity change
Changes the intensity of the masking signal in the selected dB steps. To change this setting, select **SETUP**, 37 STIMULI KNOB ▶ 112.

When you turn the knob clockwise, the intensity is increased and when you turn the knob counter-clockwise, the intensity is decreased.

Shortcut functions
You can also use the right LEVEL selector to

dB LEVEL right - shortcut functions	
Talkback level	Set the level of Talk Back.
Warble modulation, amplitude	Warble frequency (in SETUP) and amplitude.
Pulse frequency	Pulse frequency,
Impulse time	Impulse time,

dB LEVEL right - shortcut functions	
Input sensitivity, speech	Input sensitivity for speech testing.
Word counting method, speech	Choice of word counting method for speech testing.
Alternating Fowler frequency	Alternating Fowler frequency.
Master volume, HIS	Master volume value selection in HIS.
Parameter selection, SETUP	Parameter selection in SETUP.
Power out voltage	DC POWER OUT voltage.

3.2.23 Left INT button (FAIL)

Presentation of test signal. This function depends on whether presentation mode is set to normal, or **REVERSE** is activated. This is shown by the output indicator (see 3.2.6 The OUTPUT test signal indicators ▶ 23).

Normally the test signal is present when you press the button.

If you press **REVERSE** the test signal disappears.

- **Speech testing**
  Press this button to count "unheard words" (FAIL).

3.2.24 Right INT button (PASS)

Usually functions in total parallel with the **left INT** button.

Use the **right INT** button to control the masking signal. This will either present or interrupt the masking signal depending on the setting in **SETUP**, 9 MASK. PRESENT. ▶ 103.

- **Speech testing**
  Press this button to count "heard words" (PASS).
- **SISI**
  Use the **right INT** button to register "Pass" when the patient is unable to use the Patient Response switch.

3.3 Socket connections - rear panel

The socket connections on the back of Itera II are protected by a guard, which is hinged onto the front panel and held shut by a spring-clip at each end. Open this guard in order to connect or disconnect accessories or cables to the back of Itera II.

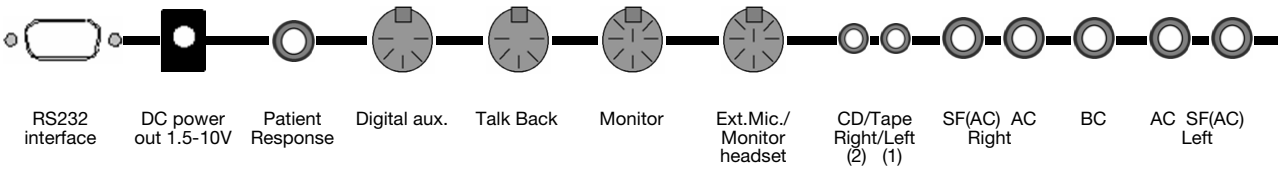


Fig. 3 Itera II rear panel

3.3.1 Description

SF (AC)
To the "SF Transducer output". Here you can connect any headphone or free field system.

Connect the blue 1/4" jack plug for left (**SF Left**) and the red 1/4" jack plug for right (**SF Right**).

AC
Connection for the AC transducer to the enclosed headphone. Blue 1/4" jack plug for left (**AC Left**) and red 1/4" jack plug for right (**AC Right**).

BC
Connect the black 1/4" jack plug from the bone conductor.

CD/TAPE
Connection of CD or tape recorder - Left (1) and Right (2).

Caution · *When you connect other electrical equipment to Itera II, remember that equipment that does not comply with the same safety standards as Itera II can lead to a general reduction in the system's safety level.*

Note · *It is recommended that the Itera II supplies power to the CD/Tape player.*

EXTERNAL MIC./MONITOR HEADSET
Connection for the gooseneck microphones for speech audiometry or monitor headset with internal microphone.

MONITOR
Connection for the monitor head set without internal microphone. Can be used if a stereo microphone is connected to EXT. MIC./MONITOR HEADSET.

TALK BACK
Connection for the Talk Back microphone, for communication from patient to operator. Set the switch on the Talk Back microphone to ON.

DIGITAL AUX
N/A.

PATIENT RESPONSE
Connect the black 1/4" jack plug from the Patient Response switch. When the patient presses the Patient Response switch, this lights the RESPONSE indicator light and gives an audible "beep" from Itera II.

DC POWER OUT
Power supply for the CD/TAPE player. Adjustable from **SETUP**, 35 CD POWER SUPPLY ▶ 111 (OFF and 1.5 - 10 volt DC, 500 mA). Use the **right LEVEL** selector to select.

Note · *Remember to use an adapter if necessary so that the CD has the correct polarity. The centre pin is + and the sheath is 0V.*

Note · *It is recommended that Itera II supplies power to the CD/Tape player.*

RS 232 INTERFACE
To connect Itera II to a PC, use the optional 9-pole PC- RS232 interface cable.

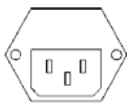
The installation must be carried out in accordance with EN 60601-1-1 plus addendum in the form of Part 1: General provisions -1 and UL2601-1 CAN/CSA-C22.2 NO 601.1-90. The supplementary provisions on the reliability of electro-medical systems.

It is a general rule for all electrical equipment used in the proximity of the patient that:

- The connected equipment must comply with EN60601-1 and/or EN60601-1-1.

Any PC connected to Itera II must comply with the requirements of IEC 950, "Safety of information technology equipment, including electrical business equipment".

For information on how to use Itera II with a PC, see 9 Managing Data and Results ▶ 97.



Supply voltage connection
100-240 V AC, 50/60 Hz, 60 VA
Fuses: 2 T 1A L/250 V, 5 mm 20 mm.

Warning · *Before you replace a fuse, first switch off the instrument and disconnect it from the mains power supply. See 12.2.3 Replacing fuses ▶ 124.*

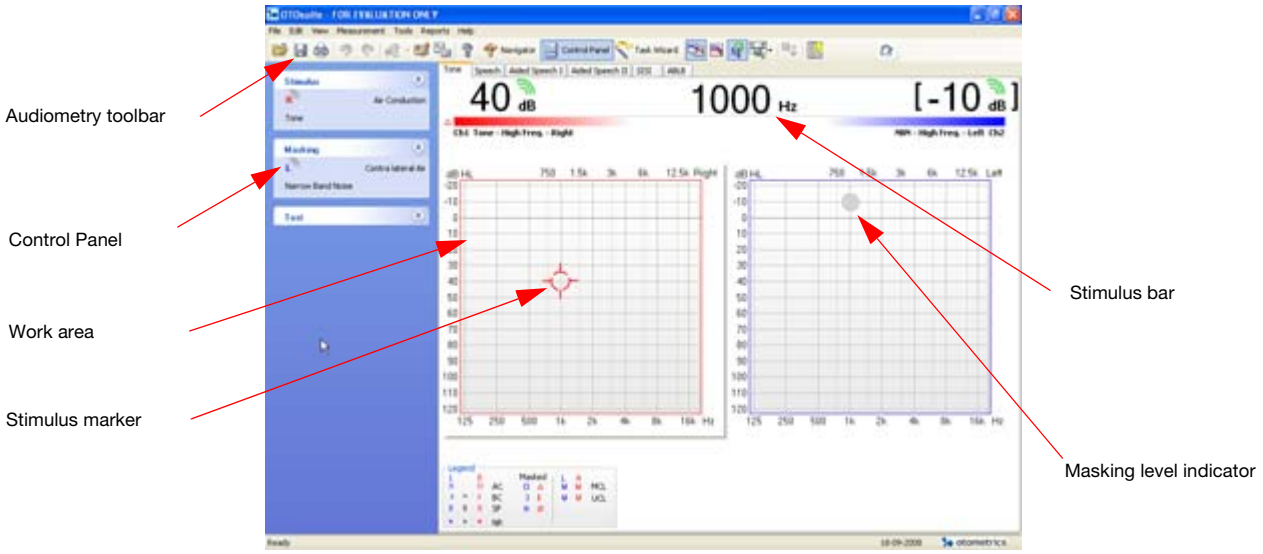
3.4 Side panel

Power ON/OFF

4 Navigating in the OTOsuite Audiometry Module

The general functions for navigating in the main window are described in the OTOsuite manual.

Audiometry elements



Screen descriptions

You will find descriptions of the actual screens and how to use and view them in:

4.5 The Tone test screen ▶ 45
4.6 The Speech test screen ▶ 48
4.7 The Aided Speech test screen ▶ 51

4.1 Audiometry Module features

Note · *Some of the features below are device-dependent.*

With the Audiometry Module, you can

- perform testing, using the Audiometry Module as a handy control panel while you follow stimulus settings and test progress on your PC display

- view and print test results
- view historic audiometry results from NOAH or XML
- view online audiometry results during testing
  - Tone testing
  - Speech testing
- use the Masking Assistant to prompt when masking is recommended
- view the masking level indicator in audiogram
- view audiogram overlays
- enter tester details and test date entry for manually entered audiograms
- enter special test and tuning fork test results
- perform “over the rim” testing, using the audiometer as a handy control panel while you follow stimulus settings and test progress on your PC display

4.2 The Audiometry Module menu system and toolbar

The **Menu bar** is located at the top of the window. Some of the menu items are also available as icons.

The icons available in the **Toolbar** depend on the test functions included in your OTOsuite and/or whether a test device is connected.

General icons

The general OTOsuite menu system and toolbar are described in the OTOsuite User Manual.

Audiometry icons

Some of the icons in the Audiometry toolbar are toggle icons. Click to toggle to another selection.

The menu selections and toolbar specific to the Audiometry Module are described below.

Note · *Some of the menu selections and functions are device-specific, and may not apply to your setup.*

File/OTOsuite menu

New Audiogram	
	• Click to select new audiogram. You will be prompted to save or cancel current data.

Edit menu

Audiometric properties... (Ctrl+U)	
	• Click to enter Tester name, Test Date, and air conduction transducer for a manually entered audiogram. **Note** · *The air conduction transducer is stored when you have selected it in the transducer section of the Control Panel and data points are entered on the audiogram.*

View menu

Masking Assistant	
	• Click to enable or disable the Masking Assistant. The Masking Assistant causes an unmasked threshold to flash repeatedly if masking is recommended.

Overlays	
	• Click to enable or disable the overlays. Overlays display pictures, severity, speech banana, speech letters, and/or unusable area on the audiogram. **Note** · *Overlays can also be displayed by selecting them from the overlay box below or next to the audiogram. To view/hide the overlay box, select* **Tools > Options > General**.

Combined Audiogram	
	**Combined View** • *Menu item:* Click to toggle between viewing both ears in a single audiogram (combined audiogram) or both a left and a right audiogram on your screen. • *Icon:* Click to view both ears in a single audiogram.

	**Split View** *Icon:* Click to view separate audiograms for each ear.
Left - Right	*Menu item:* Click to display the left ear audiogram on the left side of the window and the right ear audiogram on the right side of the window (when **Split view** is enabled).
Right - Left	*Menu item:* Click to display the right ear audiogram on the left side of the window and the left ear audiogram on the right side of the window (when **Split view** is enabled).

Audiogram Legend	
	Click to enable or disable the display of the audiogram legend. The legend contains the most commonly used symbols for the audiogram. It is not configurable.

Standard / All / High frequencies	
	**Frequency range** Click to choose between viewing: • Standard frequencies • All frequencies • High frequencies
	**Standard frequencies** Displays the audiogram from 125 to 8000 Hz.

Standard / All / High frequencies	
	**All frequencies** Displays the audiogram from 125 to 20,000 Hz.
	**High frequencies** Displays the audiogram from 8000 to 20,000 Hz.

Tools menu

Curves and Symbols	
	• Click to select the Curves and Symbols dialog box. This dialog box and its related function are specific to configuring the curves and symbols to be displayed on the audiogram or speech graph during testing. See 4.9 Curves and symbols selection ▶ 52.

Fetch test results...	
	• See description in 5.5 Fetch test results from audiometer ▶ 63.

Options	
	• See description of how to work with user options and User Tests in the OTOsuite User Manual.

Additional icons

Import Audiometry Data	
	Click to import audiometry data from AURICAL Plus and MADSEN Conera. See the OTOsuite User Manual.

4.3 The Audiometry Module Control Panel

Note · *The appearance of the Control Panel depends on the test device used.*

The general function of the Control Panel is described in the OTOsuite User Manual.

The Audiometry Module Control Panel shows the settings available for the specific test in the connected audiometer.

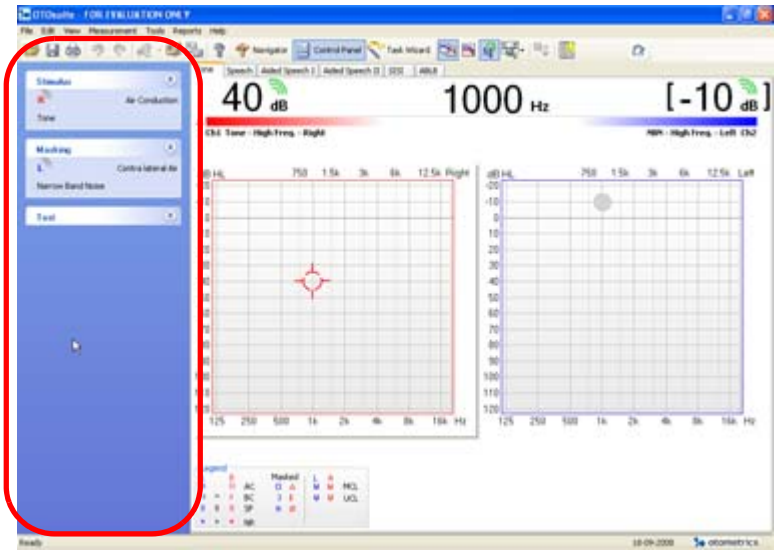
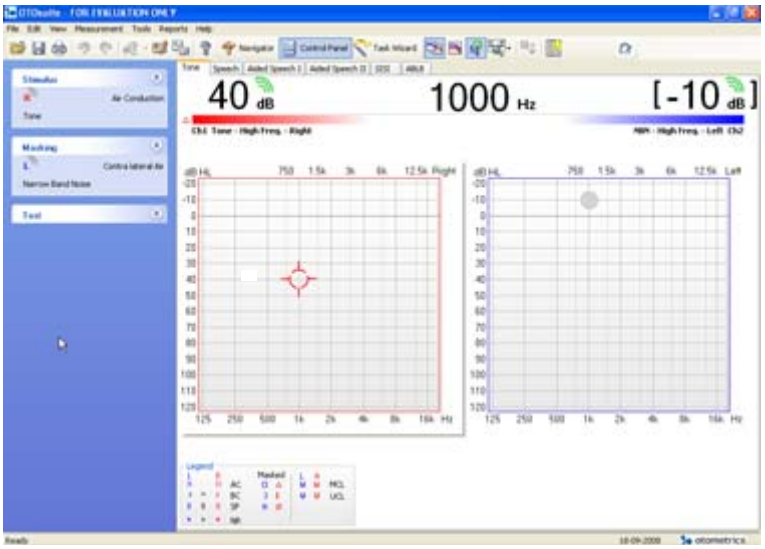


Fig. 4 The MADSEN Itera II Control Panel

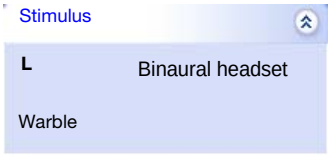
4.3.1 The MADSEN Itera II Control Panel

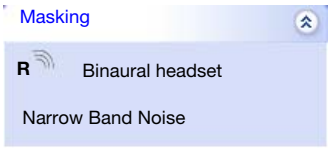
When you activate the Audiometry Module Control Panel, OTOsuite automatically connects to your Otometrics audiometer and displays the Control Panel. You cannot operate MADSEN Itera II from the Control Panel.

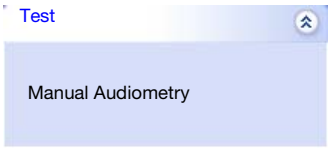
This Control Panel is divided into a number of sections, where you can view various settings, and a section for controlling communication with the audiometer.

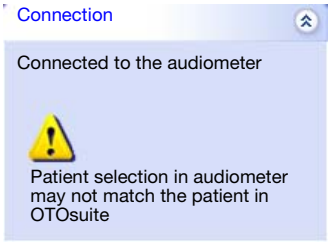


Control Panel

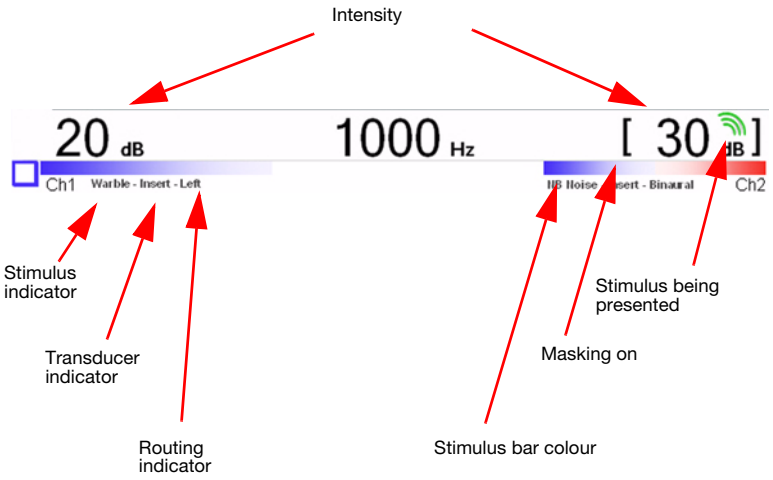
The Stimulus Panel	
	The Stimulus Panel shows the stimulus type used and the selected test ear. Refer to your Audiometer manual for a description of available stimulus types.

The Masking Panel	
	The Masking Panel shows the masking used and the selected test ear. Refer to your Audiometer manual for a description of available masking types.

The Test Panel	
	The Test Panel shows the test type used. Refer to your Audiometer manual for a description of available test types.

The Connection Panel	
	**Note** · *If there is a risk that patient selected in the audiometer does not correspond to the patient shown in the OTOsuite or NOAH status bar, a warning triangle will be shown on the screen.* • Make sure that you select the correct patient, either in the audiometer or in OTOsuite.

4.4 The stimulus bar



During online testing, the stimulus bar shows:

- The stimulus and level being presented.
- Stimulus type.
- The current frequency.
- Masking, when presented, and masking level.
- Masking type.

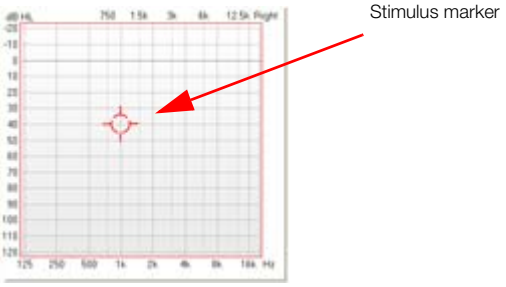
Intensity
Indicated by the dB level above the channel status bars. • Masking is denoted by square brackets around the level (calibrated in effective masking level). • The green triple wave symbol above the level indicates that the stimulus is currently being presented.

Stimulus bar color
Indicates the routing for each channel: • Blue = left ear • Red = right ear • Blue/Red = binaural • Gray = unspecified

Stimulus, transducer and routing indicators
The stimulus/masking type, the transducer and the routing for each channel.

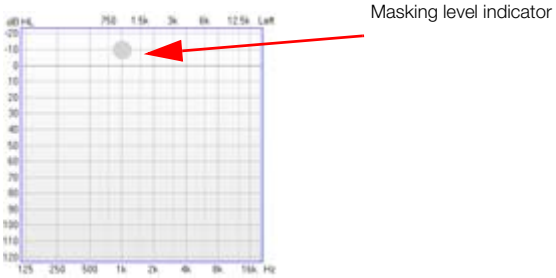
Stimulus marker

- The stimulus cross is your visual aid to identify the frequency and level being tested.



The Masking level indicator

- The masking level indicator is shown behind the curves and symbols when when masking is on.



4.4.1 The Tone stimulus bar

Fig. 5 Features specific to the Tone stimulus bar

During online testing, the stimulus bar shows:

- **Symbol**
  Indicates the symbol being used when storing a data point (i.e. blue square - indicating left masked air conduction threshold).
- **Frequency**
  Indicated by the Hz value in the center of the stimulus bar.

4.4.2 The Speech stimulus bar

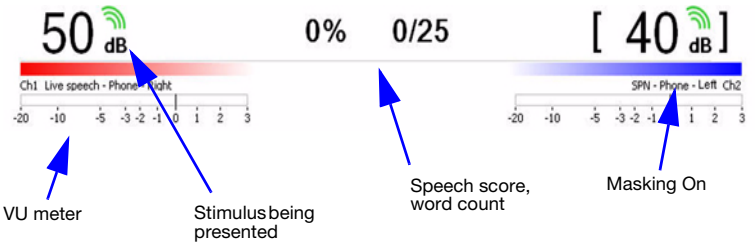


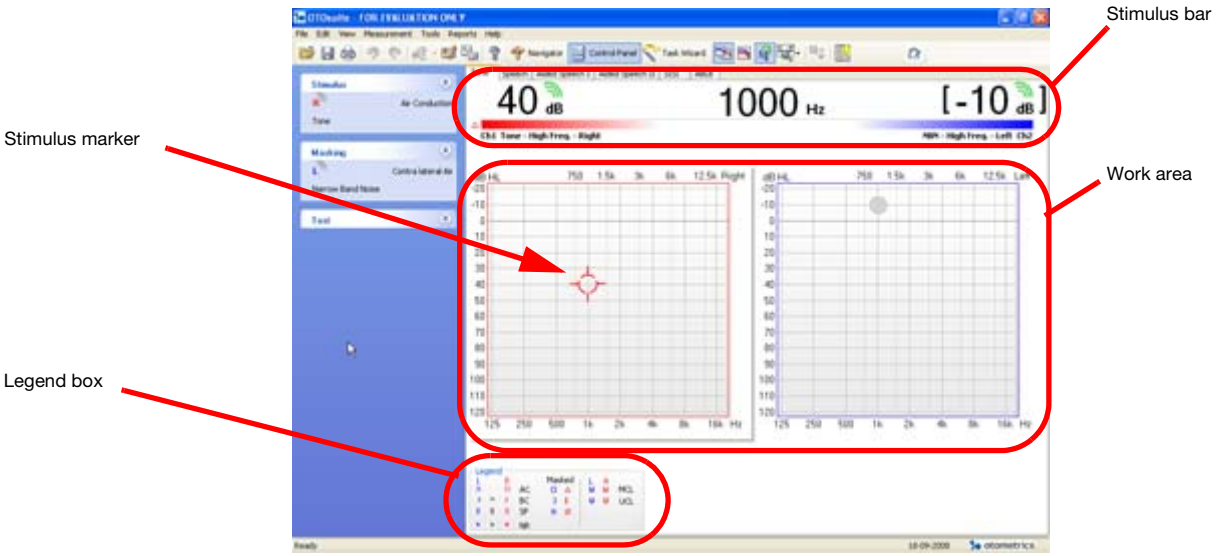
Fig. 6 Features specific to the Speech stimulus bar

During online testing, the stimulus bar shows:

- **Speech Score/Word Count**
  Displays the percentage correct/incorrect and the amount of words correct/incorrect out of a given number of words. You can display speech score and word count either as “% Correct” or as “% Incorrect”. To set your preference, select **Tools > Options > Speech > View > Score Presentation**.
- **VU Meter**
  Displays the sensitivity of the test microphone or speech material.

4.5 The Tone test screen

During online testing, the screen reflects the test done by the audiometer as it progresses.



4.5.1 The work area in the Tone screen - the audiogram

The audiogram of the selected Client is displayed.

During testing, the threshold symbols are entered automatically in the audiogram.

Cross Hatch	
	Indicates your current stimulus level and frequency. The color of the cross hatch indicates the routing: • Blue = left, • Red = right, and • Black = binaural

You can choose between

Tone testing - combined view audiogram

Click the **Combined view** icon to select.

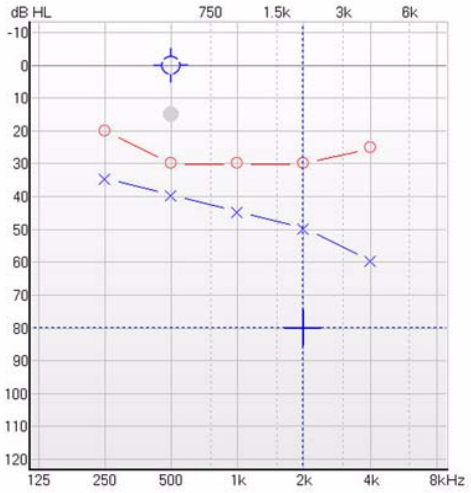


Fig. 7 Tone testing - combined view audiogram

Tone testing - split view audiogram

Click the **Split view** icon to select.

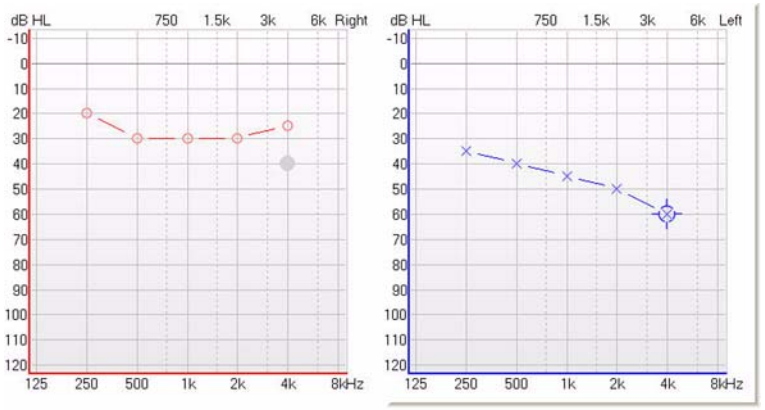
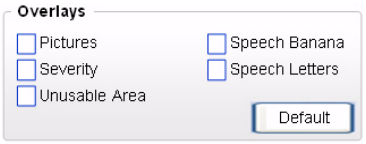


Fig. 8 Tone testing - split view audiogram

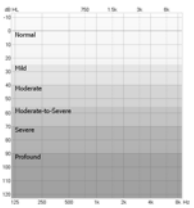
4.5.2 Tone view options

You can access a number of tone display options directly from the Tone main screen.

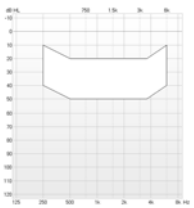
- **Overlays**
  Select the overlay that will be displayed on the audiogram. These overlays assist in the counseling process. Select **Tools > Options > Audiometry > Tone > Overlays** to enable or disable displaying the overlays.



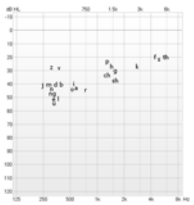
– **Pictures**
Displays pictures representing common environmental sounds at their approximate dB level (e.g. bird, plane).



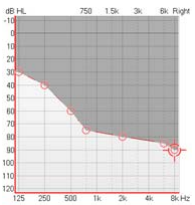
– **Severity**
Displays the audiometric severity levels (normal, mild, moderate, moderate-to-severe, severe, profound).



– **Speech Banana**
Displays the speech banana of a listener with normal hearing.



– **Speech Letters**
Displays speech sounds at their approximate dB level.



– **Unusable area**
Shades the area which is outside the patient's dynamic range of hearing.

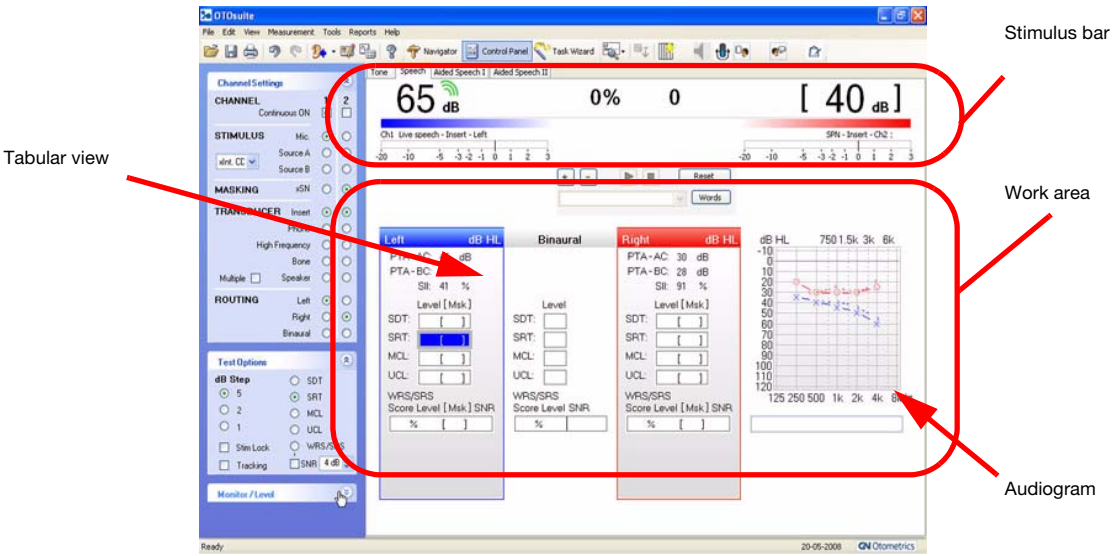
– **Default**
Returns the overlay options back to whatever has been set as default.

4.5.3 The Legend box

The Legend box shows the audiogram symbols used in the graphs.

4.6 The Speech test screen

During online testing, the screen reflects the test done by the audiometer as it progresses.



4.6.1 The work area in the Speech screen

The speech test results of the selected Client are shown automatically in the stimulus bar.

You can choose between

- tabular view. See Fig. 9 ▶ 49.

- graph view. See Fig. 10 ▶ 50.

Speech testing - tabular view

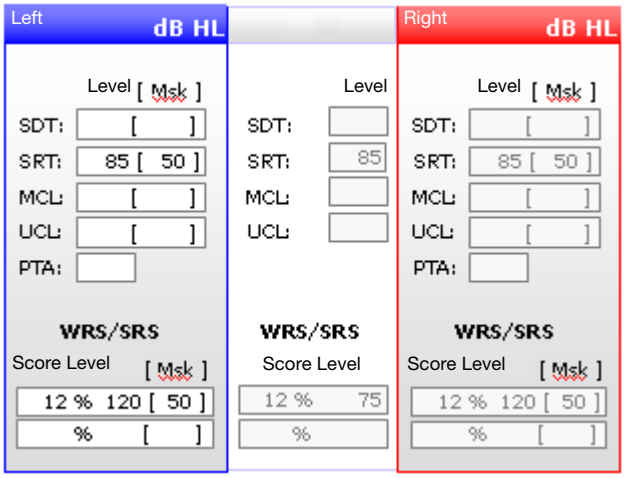


Fig. 9 Speech testing - tabular view

The Speech Table displays the scores for right, binaural and left ear data collection.

During testing, the word count results are shown automatically.

- **Entering results in Score tables**
  To enter the results in the Score tables, simply left-click in the required field.
- **Deleting results in Score tables**
  To delete specific results in the Score tables, simply right-click in the required field and select Delete.
- **Storing results in Score tables**
  To store results in the Score tables, simply right-click in the required field and select Store.
- **PTA field**
  To select the frequencies from which the average is to be calculated, select **Tools - Options - Audiometry - General - PTA Frequency**, and enter your selections.

Speech testing - graph view

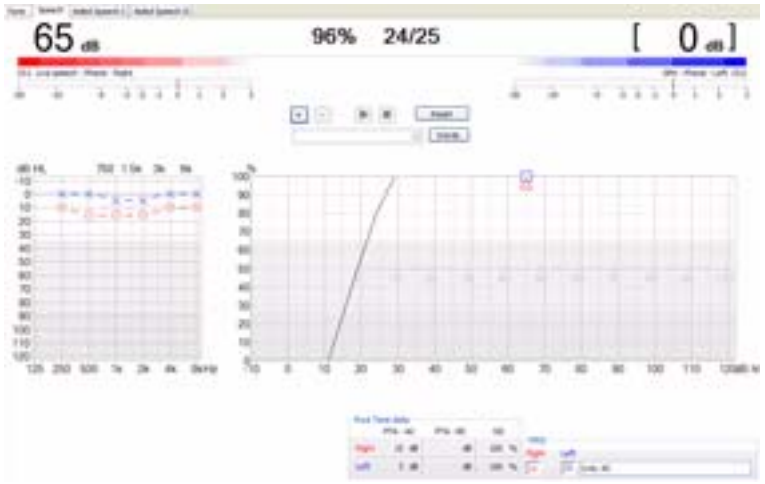


Fig. 10 Speech testing - graph view

The Speech Graph screen displays the speech graph which includes SDT, SRT, MCL, UCL noted by a line (blue = left, red = right) at the corresponding dB level.

Symbols will be shown based on the location corresponding to the dB level of presentation and the percentage of correct responses.

4.6.2 The Legend box

The Legend box shows the audiogram symbols used in the graphs.

4.6.3 Terms and abbreviations used in Speech testing

SDT Speech Detection Threshold

SRT Speech Recognition Threshold

MCL Most Comfortable Level, speech

UCL UnComfortable Level, speech

WRS/SRS Word Recognition Score/Sentence Recognition Score

Can store up to 4 lines of WRS/SRS scores. An additional line appears (max 4) when you change settings (level, speech material, etc).

- Score
  Percentage of correct/incorrect words.

- Level
  dB level at which the words were presented.
- Noise
  dB level of masking. The masking stimulus is considered noise if it is presented into the contralateral (opposite) ear in relation to the stimulus ear.
- SNR
  Signal-to-Noise Ratio calculated as the difference between the dB of the stimulus and the dB of the masking. The SNR is only calculated if the masking signal is in the ipsilateral (same) ear in relation to the stimulus ear.

PTA Pure Tone Average

4.7 The Aided Speech test screen

This screen is for testing clients with hearing instruments.

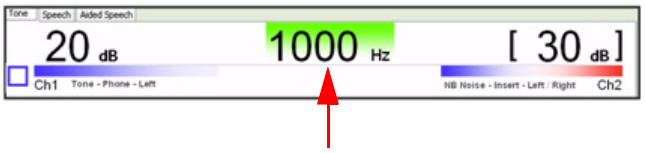
For a description of the screen and its functionalities, see 4.6 The Speech test screen ▶ 48.

4.8 The Patient Responder indicator

When the patient presses the Patient Responder, this is shown on the Stimulus bar, and a "beep" from the PC is heard through the Monitor Speaker or Operator Headset.

Single Responder setup

- Amber
  Indicates that the patient is pressing the response button.

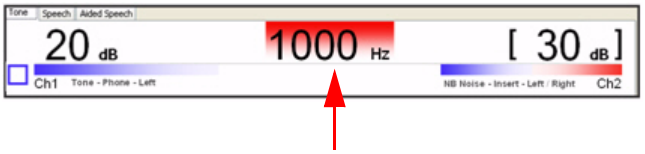


Dual Responder setup

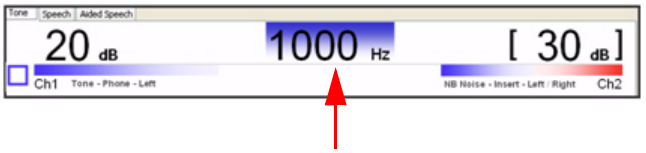
If separation is activated when the patient presses the Patient Responder button, a response indication coloured Red or Blue is shown, depending on the button pressed.

If separation is not activated when the patient presses the Patient Responder button, then either button will show the same response indication (Amber).

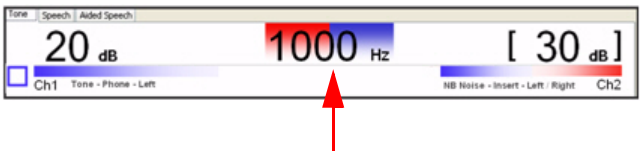
- Red
  Indicates that the patient is pressing the right response button.



- Blue
  Indicates that the patient is pressing the left response button.



- Red and blue
  Indicates that the patient is pressing both response buttons.

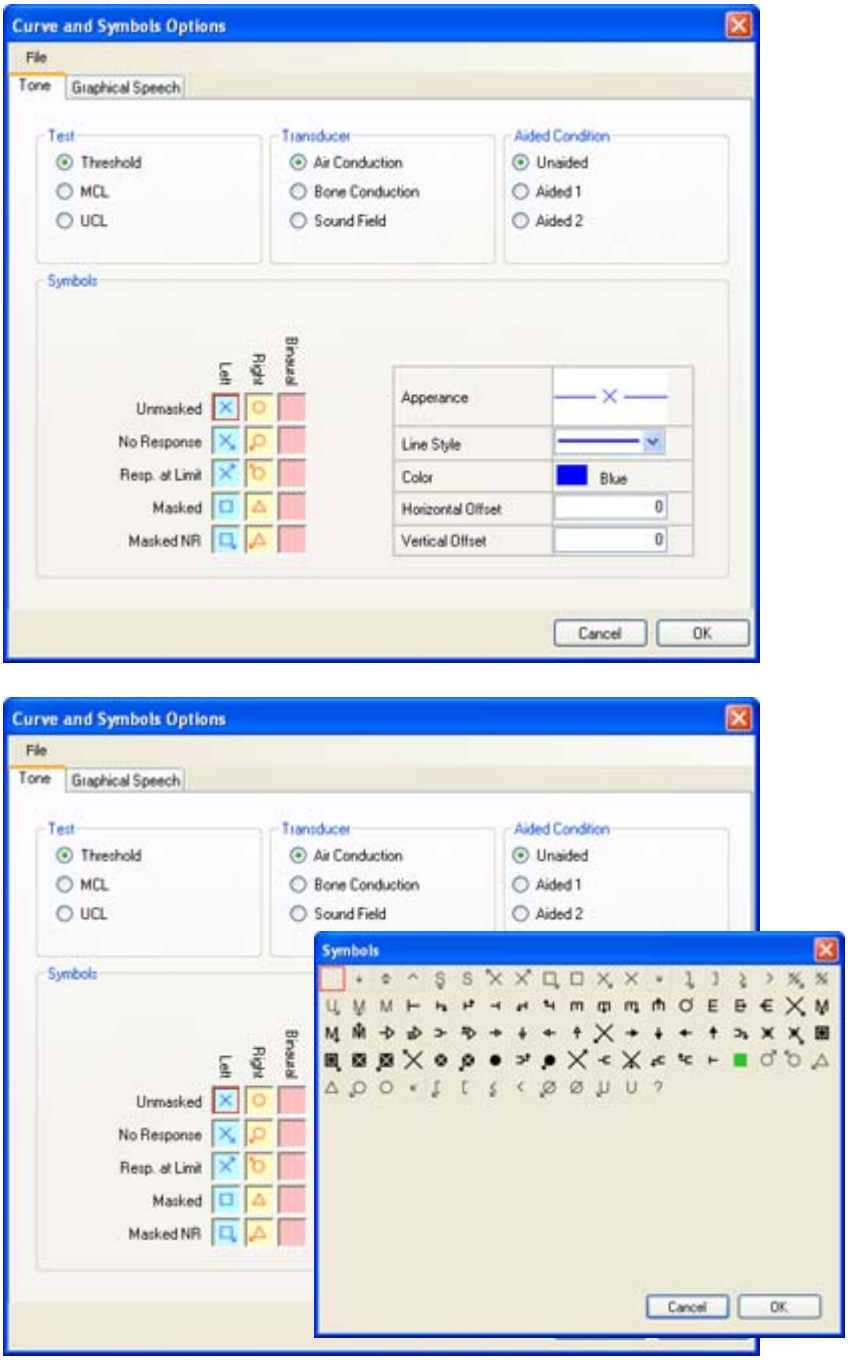


4.9 Curves and symbols selection

4.9.1 Selecting a symbol or curve

You can select a symbol and/or a curve style for a specific measurement.

1. To do so, select **Tools > Curves and Symbols...**
2. Click on the selections that apply to your measurement under **Test**, **Transducer**, and **Aided Condition**. The current symbols and line style are shown.
3. Double-click on the symbol you wish to change. The **Symbols** selection dialog box is shown.
4. Double-click on the symbol you wish to use.
5. To change the line style of the curve, select from the **Line Style** drop-down list.
6. To change the color, double-click on the current **Color** square. Select a new color or click on **Define custom colors>>** to select a color not shown. Click **OK**.
7. To optimize viewing of the audiogram, you can offset the symbols in relation to the audiogram grid in the fields **Horizontal Offset** and **Vertical Offset**.
   You can superimpose symbols on the audiogram where two different points share the same value (i.e. air and bone threshold). In order to see both superimposed symbols, you can define an offset direction for each individual symbol.



4.9.2 Creating new symbols

1. Use Microsoft Powerpoint to create vector graphics that you save as Enhanced Meta Files (*.emf).

2. The outer size of the EMF file must not be larger than or equal to 1 x 1 inches (2.5 x 2.5 cm).

Note · *If the symbols are created larger than that, this may severely compromise the performance of OTOsuite.*

   The standard symbols are drawn within a centered inner frame of 1.5 x 1.5 cm (0.6 x 0.6 inches).

   The area between the inner and outer frames is used for additions to the main symbol, such as arrows for "No Response" or "Response at Limit", and designators for "Aided Left" or "Aided Right".

3. Before you store the new graphic, make sure that the outer and inner frames are invisible: select the frame, and set the line color to "No Line". Repeat this for each frame.
4. To save as an *.emf picture file, select all elements in the drawing (typically this includes the invisible outer frame as well as the symbol itself centered within the frame). Right-click and select **Save as picture...**
5. Name the figure and select the file type *.emf.
6. Save it in **C:\Program Files\GN Otometrics\OTOsuite\AudSymbols**.
7. Launch the OTOsuite Audiometry Software Module and go to **Tools > Curves and Symbols**. The new symbol should appear on the list of symbol options.
   In this dialog box, you also have options for setting the color, line type, and horizontal and vertical offsets that will apply when you use the new symbol.

4.10 The Masking Assistant

If the Masking Assistant is enabled, it will at all times check for frequencies that may require testing with masking. This also applies to old audiograms imported from NOAH or XML as long as a supported transducer was stored with the data.

The Masking Assistant is a tool provided to help you with an indication that there may be frequencies where testing with masking[1] is recommended.

- The audiogram symbol will flash at the specific frequencies where contralateral masking may be recommended[2].

[1] (Katz, J., Lezynski, J. (2002). Clinical Masking. In J. Katz, ed., *Handbook of Clinical Audiology*, Williams and Wilkins, Baltimore.)

[2] Based on criteria described in *Clinical Masking, Essentials of Audiology, Stanley A. Gelfand, Thieme 1997*, and *Measurement of Pure Tone Hearing Thresholds, Audiologists' Desk Reference - Vol 1, James W. Hall III, H. Gustav Mueller III, Singular Publishing Group 1997.* and *Munro K.J., Agnew N. A comparison of inter-aural attenuation with the Etymotic ER-3A insert earphone and the Telephonics TDH-39 supra-aural earphone. Br J Audiol 1999; 33: 259-262.*

- The bone conduction masking criterion is configurable (0 - 15 dB air-bone gap). Select **Tools > Options > Tone > Masking Assistant > BC Masking Criterion**.

Only stored thresholds measured without masking are checked. Levels which did not evoke a response are excluded from the check. This means that as soon as a masked threshold has been stored, the flashing stops for that frequency.

Terminology

AC	AC test ear
ACc	AC contra
BC	BC
BCc	BC contra
Min IA	Minimum inter-aural attenuation.

When is masking required?

Masking is recommended when the following conditions are met:

AC:		AC > ACc + Min IA
	or	AC > BCc + Min IA
BC:		BC < AC - x* dB

* denotes configurable Air/Bone gap criterion (**Tools > Options... > Audiometry > Tone > Masking assistant > BC Masking Criterion**).

Min IA is frequency specific

These are the Min IA tables for TDH-39 and Otometrics Inserts used in the Masking Assistant [1].

Min IA (Supraaural Phone: TDH-39), frequency specific

Hz	TDH-39	
125	35	Katz & Lezynski, (2002)
250	48	Munro & Agnew, BJA (1999)
500	44	Munro & Agnew, BJA (1999)

[1] Katz, J., Lezynski, J. (2002). Clinical Masking. In J. Katz, ed., *Handbook of Clinical Audiology*, Williams and Wilkins, Baltimore. Munro, K.J., Agnew, *N. A comparison of inter-aural attenuation with the Etymotic ER-3A insert earphone and the Telephonics TDH-39 supra-aural earphone*. Br J Audiol 1999; 33: 259-262. Hall, JW., MUELLER, HG. (1997). *The audiologists' desk reference*, Volume I., Singular Publishing Group, San Diego.

Hz	TDH-39	
750	40	N/A - fulfill traditional approach
1000	48	Munro & Agnew, BJA (1999)
1500	40	N/A - fulfill traditional approach
2000	44	Munro & Agnew, BJA (1999)
3000	56	Hall J.W. III & Mueller G.H. III / Munro & Agnew, BJA (1999)
4000	50	Katz J / Munro & Agnew, BJA (1999)
6000	44	Hall J.W. III & Mueller G.H. III / Munro & Agnew, BJA (1999)
8000	42	Katz J / Munro & Agnew, BJA (1999)

Min IA (Insert Phone: EAR-3A)

Hz	EAR-3A	
125	60	N/A - traditional value
250	72	Munro & Agnew, BJA (1999)
500	64	Munro & Agnew, BJA (1999)
750	60	N/A - traditional value
1000	58	Munro & Agnew, BJA (1999)
1500	60	N/A - traditional value
2000	56	Munro & Agnew, BJA (1999)
3000	58	Munro & Agnew, BJA (1999)
4000	72	Munro & Agnew, BJA (1999)
6000	54	Munro & Agnew, BJA (1999)
8000	62	Munro & Agnew, BJA (1999)

The Masking Assistant

5 Preparing MADSEN Itera II for the test

To save time it is recommended that you have set up the test environment and equipment before you prepare the patient.

5.1 Preparing the test environment

It is recommended that you carry out testing in a test environment, such as a sound booth, protected from excessive noise produced for instance by office machinery and conversation.

5.1.1 Hygienic precautions

- Be sure to follow any established infection control procedures for the setting in which you are working.
- Always use clean eartips.
- Swab the probe tip with disinfectant between ears. If one ear is infected, test the healthy ear first and change eartips between ears.
- To prevent cross-infection, use a clean eartip when you test the next patient.

5.2 Preparing the test equipment

1. Make sure that you have connected the required accessories:
   – headphones. To connect, see 13.2.2 Air conduction ▶ 128.
   – insert phone(s). To connect, see 13.2.2 Air conduction ▶ 128.
   – bone conductor. To connect, see 13.2.3 Bone conduction ▶ 128.
   – external microphone. To connect, see 13.2.4 External microphone ▶ 129.
   – free field equipment. To connect, see 13.2.5 Free Field ▶ 130.
   – patient response switch (3.3 Socket connections - rear panel ▶ 31).

5.2.1 Connecting the cables of the test equipment

Connect the cabling of the computer and various accessories as shown in the following illustrations.

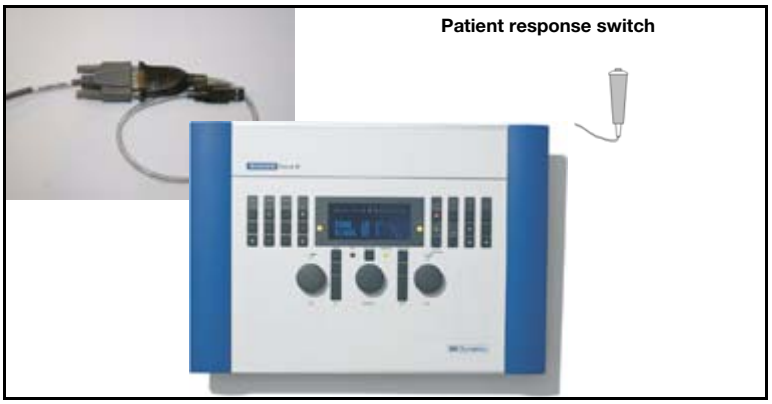
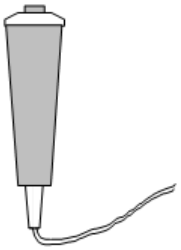


Fig. 11 USB/RS232 connection for PC or Laptop with USB port or RS232 cable for PC or Laptop with serial port

5.2.2 The patient response switch



- Place the patient facing away from the Itera II, in a sound booth, if one is available.
- Instruct the patient in how to use the Patient Response switch.
- Instruct the patient in pressing the button even if only weak signals are heard.

Note · *During automatic testing, if the patient presses the switch repeatedly during a stimulus presentation, the response is ignored.*

Note · *During automatic testing, if the patient does not release the switch, a beep is issued in the headphones. If this situation is repeated, the test is paused. Reinstruct the patient.*

- Before testing, check that the **Response** indicator lights up when the Patient Response button is pressed.

5.2.3 Preparing for air conduction testing

Headphones, insert phones
Make sure that the headphones and insert phone(s) are properly connected.

Connection to Itera II
See 13.2 Installation ▶ 127 for a description of how to connect to Itera II.

Fitting on patient
- Place the patient facing away from Itera II, in a sound booth, if one is available.

- Set the switch on the Talk Back microphone to ON and set the level of Talk Back (3.2.5 The MIC, CD and REVERSE column ▶ 23).
- Fit the headphones on the patient, with the RED phone on the right ear.
- Choose the ear with the better hearing to be tested first.

Instructing the patient

- The patient will be hearing brief tones.
- The tones may at times appear to be very weak.
- Instruct the patient in how to use the Patient Response switch (5.2.2 The patient response switch ▶ 60).
- The patient should press the Patient Response switch as soon as the tone is heard, even if it is very weak.

5.2.4 Preparing for bone conduction testing

Connection to Itera II

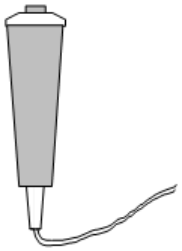
Make sure that the bone conductor is properly connected. See 13.2.3 Bone conduction ▶ 128.

Fitting on patient

When you fit the bone conductor on the patient:

- Instruct the patient in what you are about to do.

Note · *The bone conductor cable and insert phone (E-A-RTONE® 3A) cable must not be removed or tampered with while Itera II is powered on. Either disconnect the bone conductor entirely from the instrument, or make sure that the instrument itself is disconnected from the power source.*



- If a sound booth is not available, place the patient facing away from Itera II. This is to avoid visual clues during testing.
- If applicable, set the switch on the Talk Back microphone to ON and set the level of Talk Back (3.2.16 The SETUP button ▶ 27).
- Position the bone conductor/vibrator so that it rests comfortably against the mastoid bone (behind the ear) and is not in contact with the pinna, or against the patient's forehead.
- If Itera II is calibrated for this, see **SETUP**, 4 BC TRANSDUCER ▶ 102 to choose between Forehead and Mastoid, depending on the preferred placement of the bone conductor.
- **Testing with masking**
  If you intend to use masking, either use the mono insert phone (recommended) or fit the headphones so that the red (right) phone is applied to the poorer ear for masking, and the other phone is applied to the patient's temple region, leaving the test ear uncovered.

Important · *The masking transducer must not under any circumstances block or cover the bone conduction test ear. If it does, this will invalidate the test due to the occlusion effect.*

Make sure that there is no contact between the headband, which holds the Bone Conductor in place, and the headset or headband supporting the headphones. This will prevent vibrations from being conducted from one to the other. Leave it in this position until the test is finished.

Instructing the patient

- The patient will be hearing brief tones.
- The tones may at times appear to be very weak.
- The tones can be heard either in the one ear, in the other ear or in both ears simultaneously.
- Instruct the patient in how to use the Patient Response switch (5.2.2 The patient response switch ▶ 60).
- The patient should press the Patient Response switch as soon as the tone is heard, even if it is very weak.
- You may prefer that the patient indicates in which ear the tone was heard by raising a hand.
- The patient should not touch or move the bone conductor from its position.

5.2.5 Preparing for testing with masking

See 6.3.2 Air conduction with masking ▶ 72 for a recommended procedure on testing with masking.

Instructing the patient

- In addition to the tones in the test ear, the patient will be hearing a noise in the other ear.
- The tones can be heard in either ear.
- The patient should respond to the tones in the test ear and ignore the noise.
- The patient should press the patient response switch as soon as the tone is heard.
- You may prefer that the patient indicates in which ear the tone was heard by raising a hand. This is particularly relevant since masked testing is used to determine that the signal is perceived by the test ear.

5.3 Free-field

Connection to Itera II

See 13.2.5 Free Field ▶ 130 for a description of how to connect to Itera II.

5.4 Preparing the Audiometry Module for testing

1. Prepare the audiometer for the test. See the appropriate audiometer manual.
2. Follow the instructions in the OTOsuite User Manual:
   - Start up OTOsuite and the test device.
   - Select/create a client in OTOsuite.
   - Select the test type in OTOsuite.
   - Activate the Control Panel in OTOsuite.
   - Select the test ear in OTOsuite.

Fetch multiple test results

- If you have done off-line testing with MADSEN Itera II, you can fetch test results from the audiometer. See 5.5 Fetch test results from audiometer ▶ 63.

5.5 Fetch test results from audiometer

To transfer test results from your audiometer:

- Switch on the audiometer.
- Select **Tools > Fetch Test Results...**

Follow the online instructions.

5.6 Preparing the patient for testing

Previous exposure to high levels of sound

If the patient has been exposed to high levels of sound, this may create a temporary threshold shift (TTS), which will diminish with time. If the patient is tested soon after this type of noise exposure, it may not be possible to determine the normal hearing threshold. It is recommended that a minimum of 16 hours should pass between exposure and testing.

Explaining the test procedure

- Explain how the test will be done, including which ear will be tested first.
- Describe what the presented signals may sound like.
- Explain what the patient will be expected to do. This includes using the Patient Response Switch and responding to the presented signals/speech.

Preparing the patient for testing

6 Tone Testing with MADSEN Itera II

6.1 Air Conduction threshold test

Modified (ascending) Hughson-Westlake.

6.1.1 Prerequisites

- Press **TONE**.
- Press **AC**.
- If required, select another stimulus type: **WARBLE** or **PULSE** (an advantage when you test children).
- If you want to use a predefined duration of the signal presentation when you press the **INT** button, press **IMPULSE**.
- If masking is required, select the appropriate masking type: Press **MASK ON**. See also 6.3 Testing with masking ▶ 69.
- If required, turn the **FREQUENCY** knob to set the starting frequency: Typical starting frequency: 1000 Hz.

  The signal is usually presented for each tone in the following order:

  1000 Hz and increasing frequencies
  followed by
  1000 Hz (cross check) and decreasing frequencies.

- Set the initial level of the presented signal to an audible level: Turn the **LEVEL** knob to 40 dB HL.

  This is to familiarize the patient with the test signal. Other familiarization procedures may be preferred.

- Test the better ear first. If this is unknown, start with the right ear. Press **L<-->R** to select the ear you wish to test.
- Give the Patient Response switch to the patient and explain how it should be operated (see 5.2.2 The patient response switch ▶ 60).

6.1.2 Testing

1. Press the **INT** button (right or left) to present the tone to the patient for 1 to 1.5 seconds.

2. Use the corresponding **LEVEL** knob to set the intensity to approx. 20 dB above the patient's presumed threshold.
   If the patient does not respond to the presented signal, turn the **LEVEL** knob to increase the signal level in steps of 10 dB until the patient responds.

3. Reduce the signal level by 20 dB until the patient does not respond to the signal.
4. Increase the signal level in steps of 5 dB and present the signal to the patient at each level until the patient responds to the signal.
5. Reduce the signal level by 10 dB and present signals at levels increased by 5 dB until the patient responds.
6. Repeat item 5, 1 to 3 times until the patient has responded 3 times at the same level.
   This level represents the hearing threshold at 1000 Hz based on 3-5 ascending series.

   In some situations, it may be satisfactory with two responses at the same level.

   If the patient has responded less than 3 times at the same level after 5 series, present a signal at 10 dB above the level where a response was last registered.

   Then repeat item 6.

7. When the threshold is determined, press **STORE** to store that particular threshold. See 3.2.13 The STORE button ▶ 26.
8. Select the next frequency.
   You can link the Store and Next Frequency functions, so that the test progresses with the next frequency when you press **STORE**. See 13 FREQ.CH.AT STORE ▶ 104.

9. Continue to use the right and/or left **LEVEL** knob to increase/decrease intensities until you have determined all thresholds.

Note · *If the thresholds measured at 1000 Hz in the ear differ by 10 dB or more, even the other frequencies should be retested.*

10. Continue to press **STORE** after each threshold is found to store that particular threshold.
11. After each threshold is determined and stored, you will notice that as you turn the **LEVEL** knob to scroll frequencies, each stored threshold at that particular frequency will be marked by an asterisk (*) and the relevant audiogram symbol indicating the stored threshold.
12. If you are not performing the test online with the OTOsuite Audiometry Module, plot the results in an audiogram sheet.

13. Repeat this procedure for the other ear.

Note · *If there are differences between the thresholds in the two ears, see 6.3 Testing with masking ▶ 69.*

6.1.3 Sound Field testing

When you select SF transducer and Free Field speakers (F.F.) are assigned as transducers (**SETUP**, 5 SF TRANSDUCER ▶ 103), the results are stored as an individual threshold curve using the applicable Sound Field symbols (3.1 Display ▶ 17).

The symbol used for Sound Field applies to both ears, unless masking has been used.

Tip:
If ear-specific data is retrieved by blocking the contra-lateral ear, activate the masking on the audiometer to use the correct symbols. This is especially important when you use Itera II with the OTOsuite Audiometry Module.

Set the masking level to e.g. -10 dB, and note in the Comments field that the contra-lateral ear was blocked.

6.2 Bone Conduction threshold test

Note · *In Bone Conduction testing, masking is always necessary in order to determine in which ear the presented tone signal is actually heard. This is because of the reduced level of inter-aural attenuation.*

Note · *Make sure that there are no interfering ambient sounds, particularly at low frequencies. If necessary, place the patient in a sound booth.*

6.2.1 Prerequisites

- Press **TONE**.
- Press **BC**.
- If required, select another stimulus type: **WARBLE** or **PULSE**.
- Press the **REVERSE** button to set the stimulus signal to continuous presentation (use full for placing the bone conductor correctly on the patient).
- Set the dB level to a level that will be heard clearly by the patient.
- Place the bone conductor on the patient. See 5.2.4 Preparing for bone conduction testing ▶ 61.
- Find the best position for the bone conductor. Ask the patient to report when the tone seems the loudest.

- Make sure that the bone conductor stays securely in place with no contact to the pinna.
- Give the Patient Response switch to the patient and explain how it should be operated (see 5.2.2 The patient response switch ▶ 60).
- Press **REVERSE** to deactivate the **REVERSE** function.
- If you want to use a predefined duration of the signal presentation when you press the **INT** button, press **IMPULSE**.
- If masking is required, see 6.3 Testing with masking ▶ 69.
- If required, turn the **FREQUENCY** knob to set the starting frequency: Typical starting frequency: 1000 Hz.

  The signal is usually presented for each tone in the following order:

  1000 Hz and increasing frequencies,
  followed by frequencies below 1000 Hz in descending order.

  The typical test frequencies are:

  250 Hz to 4000 Hz.

- Set the initial level of the presented signal to an audible level: Turn the **LEVEL** knob to 40 dB HL.

  This is to familiarize the patient with the test signal. Other familiarization procedures may be preferred.

- If you intend to test both ears, test the better ear first. If this is unknown, start with the right ear. Press **L<-->R** to select the ear you wish to test.

6.2.2 Testing

1. Press the **INT** button (right or left) to present the tone to the patient for 1 to 1.5 seconds.
2. If the patient does not respond to the presented signal, turn the **LEVEL** knob to increase the signal level in steps of 10 dB until the patient responds.
3. Reduce the signal level by 20 dB until the patient does not respond to the signal.
4. Increase the signal level in steps of 5 dB and present the signal to the patient at each level until the patient responds to the signal.
5. Reduce the signal level by 10 dB and present signals at levels increased by 5 dB until the patient responds.
6. Repeat item 5, 1 to 3 times until the patient has responded 3 times at the same level.

   This level represents the unmasked hearing threshold at 1000 Hz based on 3-5 ascending series.

   In some situations, it may be satisfactory with two responses at the same level.

If the patient has responded less than 3 times at the same level after 5 series, present a signal at 10 dB above the level where a response was last registered.

Then repeat items 3 to 6.

7. When the threshold is determined, press **STORE** to store that particular threshold. See 3.2.13 The STORE button ▶ 26.
8. Turn the **FREQUENCY** knob to select the next frequency.

   You can link the Store and Next Frequency functions, so that the test progresses with the next frequency when you press **STORE**. See 13 FREQ.CH.AT STORE ▶ 104.

9. Continue to use the right and/or left **LEVEL** knob to increase/decrease intensities until you have determined all thresholds.
10. Continue to press **STORE** after each threshold is found to store that particular threshold.
11. After each threshold is determined and stored, you will notice that as you turn the **LEVEL** knob to scroll frequencies, each stored threshold at that particular frequency will be marked by an asterisk (*) and the relevant audiogram symbol indicating the stored threshold.
12. If you are not performing the test online with the OTOsuite Audiometry Module, plot the results in an audiogram sheet.
13. Repeat this procedure for the other ear.

Note · *If the difference between the air conducted threshold and the unmasked bone conduction threshold of the same ear is 15 dB or greater, it is recommended that you retest bone conduction thresholds with masking applied to the contralateral ear. See 6.3 Testing with masking ▶ 69.*

6.3 Testing with masking

To prepare the patient for masking, see 5.2.5 Preparing for testing with masking ▶ 62.

6.3.1 When is masking required?

When to use masking for Air Conduction testing
If the difference between the thresholds in the two ears is 40 dB (TDH39), or 60 dB (EAR-3A), or greater, it is recommended that you test the poorer ear again with masking applied to the better ear.

If the appliance of masking is to be optimally administered without using unnecessary masking, it is recommended in the literature not to use the one-number-fits-all 40 dB criterion for circum-aural and 55 to 60 dB criterion for insert phones. This may cause errors, and will increase the test time, as well as increase the strain on the patient. Instead, the literature recommends the use of frequency specific criteria that would be taken from transducer specific inter-aural attenuation tables available from clinical studies.[1] See also

When to use masking for Bone Conduction testing

If the difference between the air conducted threshold and the unmasked bone conduction threshold of the same ear is 15 dB or greater, it is recommended that you retest bone conduction thresholds with masking applied to the contralateral ear. See 6.3 Testing with masking ▶ 69.

When to use an insert phone

Masking via insert phone is recommended. The insert phone gives less inter-aural cross talk than the TDH39 headphones.

- Use the insert phone instead of the TDH39 headphones for masking when you test the Bone Conduction threshold of patients with much more hearing loss in one ear than in the other. This will reduce the risk of over-masking caused by the high masking level required in the poorer ear.

  In order to use the insert phone for masking bone conduction, the EAR-3A must be included as a transducer for your audiometer. It will be available either as the standard AC transducer, or as an SF transducer. Make sure that it is selected in **SETUP**, 7 BC MASKING ▶ 103.

The test procedure is similar to that described in 6.3.3 Bone conduction with masking ▶ 73.

Min IA is frequency specific

These are the Min IA tables for TDH-39 and EAR-3A that you can use to optimize the use of masking.

The numbers are rounded down to the closest 5 dB step.

Min IA TDH-39

Hz	dB	Source
125	35	Katz & Lezynski, (2002)
250	48	Munro & Agnew, BJA (1999)

[1] (Katz, J., Lezynski, J. (2002). Clinical Masking. In J. Katz, ed., *Handbook of Clinical Audiology*, Williams and Wilkins, Baltimore.)

Hz	dB	Source
500	44	Munro & Agnew, BJA (1999)
750	40	N/A - traditional approach
1000	48	Munro & Agnew, BJA (1999)
1500	40	N/A - traditional approach
2000	44	Munro & Agnew, BJA (1999)
3000	56	Munro & Agnew, BJA (1999)
4000	50	Munro & Agnew, BJA (1999)
6000	44	Munro & Agnew, BJA (1999)
8000	42	Munro & Agnew, BJA (1999)

Min IA EAR-3A

Hz	dB	Source
125	35	N/A - traditional approach
250	48	Munro & Agnew, BJA (1999)
500	44	Munro & Agnew, BJA (1999)
750	40	N/A - traditional approach
1000	48	Munro & Agnew, BJA (1999)
1500	40	N/A - traditional approach
2000	44	Munro & Agnew, BJA (1999)
3000	56	Munro & Agnew, BJA (1999)
4000	50	Munro & Agnew, BJA (1999)
6000	44	Munro & Agnew, BJA (1999)
8000	42	Munro & Agnew, BJA (1999)

6.3.2 Air conduction with masking

Suggested procedure

Prerequisites

The unmasked hearing thresholds have first been determined as described in 6.1 Air Conduction threshold test ▶ 65.

Prerequisites as in 6.1 Air Conduction threshold test ▶ 65.

- Prepare the patient for testing with masking. See 5.2.5 Preparing for testing with masking ▶ 62.
- It is recommended to use the default setup used in connection with selecting **MASK ON** for presenting the masking signal as continuous presentation.
  This means that you will not be using the **INT** button to control the masking signal.

Testing

1. Press **MASK ON** to activate contralateral masking.
2. Set the masking level at the threshold of the masking ear and make sure that it is heard by the patient.

   If it is not, increase the masking level.

3. Present the tone to the test ear at the unmasked threshold level.
   If the tone is not heard, increase the level in 5 dB steps until the patient responds.

4. When the patient responds, increase the masking level in 5 dB steps.

   After each increase, present the tone no more than twice. The tone is considered heard if the patient responds at least once.

   If the tone is heard when the masking level has been increased with at least three 5 dB steps, the so called masking plateau has been reached and the test tone level is considered the masked hearing threshold level.

5. If the tone is not heard when the masking level is increased, increase the test tone level until the tone is heard by the patient.
   Repeat from step 4.

6. If the test tone level at the masking plateau (established in step 4) is within 5 dB from the unmasked threshold level, you can skip step 7.
7. Keep the established masking level and confirm the masked hearing threshold level. To do so:

Decrease the test tone level by 10 dB and increase in 5 dB steps.

The patient should respond within 5 dB from the previously determined masked threshold level.

If not, repeat from step 2.

8. If required, test the remaining frequencies in the same way and switch to the other ear.

6.3.3 Bone conduction with masking

Suggested procedure

Prerequisites

Prerequisites as in 6.2 Bone Conduction threshold test ▶ 67.

- Prepare the patient for testing with masking. See 5.2.5 Preparing for testing with masking ▶ 62.
- It is recommended to use the default setup used in connection with selecting **MASK ON** for presenting the masking signal as continuous presentation.
  This means that you will not be using the **INT** button to control the masking signal.

Testing

1. Establish the unmasked bone threshold. If this has been done previously, and a different level is established in this step, do not overwrite the previously recorded threshold. The conditions may have changed if the masking transducers were placed following the first test (for example due to the occlusion effect).
2. Press **MASK ON** to activate masking.
3. Set the masking level at the air conduction threshold of the masking ear and make sure that it is heard by the patient.

   If it is not, increase the masking level.

4. Present the tone to the test ear at the previously confirmed unmasked bone conduction threshold level.
   If the tone is not heard, increase the level in 5 dB steps until the patient responds.

5. When the patient responds, increase the masking level in 5 dB steps.
   After each increase, present the tone no more than twice. The tone is considered heard if the patient responds at least once.

If the tone is heard when the masking level has been increased with at least three 5 dB steps, the so called masking plateau has been reached and the test tone level is considered the masked hearing threshold level.

6. If the tone is not heard when the masking level is increased, increase the test tone level until the tone is heard by the patient.

   Repeat from step 5.

7. If the test tone level at the masking plateau (established in step 5) is within 5 dB from the unmasked threshold level, you can skip step 8.
8. Keep the established masking level and confirm the masked hearing threshold level. To do so:

   Decrease the test tone level by 10 dB and increase in 5 dB steps.

   The patient should respond within 5 dB from the previously determined masked threshold level.

   If not, repeat from 3.

9. If required, test the remaining frequencies in the same way and switch to the other ear.

6.4 Storing thresholds

To use the store button, see 3.2.13 The STORE button ▶ 26.

Results can be stored on a PC when Itera II is used with the OTOsuite Audiometry Module.

7 Speech Audiometry with MADSEN Itera II

1. Prepare the patient for testing as described in 5 Preparing MADSEN Itera II for the test ▶ 59.
2. To select Speech testing press **SPEECH**.
3. You can now proceed with:

- 7.1 Monaural Speech Test ▶ 75, or
- 7.2 Binaural Speech Test ▶ 78

7.1 Monaural Speech Test

1. When you select Speech Test, the display shows the following:

- the top line displays the VU meter for the test signal,
- a speech counter to count the number of words heard by the patient correctly or incorrectly, and
- indication of any masking signal.
- The intensity for left and right ear is shown on the bottom line.

7.1.1 Selecting input

Select Microphone or CD input by pressing the **MIC.** or **CD** button.

- **MIC.**
  If you press **MIC.**, the microphone selection is shown briefly in the display, as follows:
  EXTERN MIC., or
  INTERN MIC.

  The display then shows the selected microphone input for the current ear:

MIC1 (default), or
MIC2

You can set the sensitivity independently for MIC1 and MIC2 (Adjusting input sensitivity ▶ 77), regardless of whether both MIC input channels are routed from:

- a single microphone (the internal microphone, an external table-top microphone or an external monitor headset),
  or from

- two different external microphones (gooseneck microphones).
  If you are using an Itera II with two built-in gooseneck microphones, the following selections apply (gooseneck microphones are external microphones):

  MIC1 = left gooseneck microphone
  MIC2 = right gooseneck microphone

Note · *If you connect an external microphone, which can be the monitor headset or the gooseneck microphones, to EXTERN MIC, this automatically disables the internal microphone (INTERN MIC.). If no external microphone is connected, the corresponding internal microphone will automatically be selected.*

- **CD**
  If you press **CD**, CD_1 or CD_2 is shown briefly in the display.
  The CD_1 input is Channel 1 (left) on the recording.
  The CD_2 input is Channel 2 (right) on the recording.

Switching between input signals

You can switch between input channels:

- Press and hold **MIC.** or **CD**, and simultaneously press **L <--> R**.
  The display will show the input channel you have selected, and flashes as long as you keep pressing the button.

You can also switch between all available inputs:

- Turn the frequency selector while you press **MIC.** or **CD**.
  In this case you get access to all possible microphone *and* CD options. If you select **CD** for one ear and the microphone for the other, both **MIC** and **CD** will light up.

One-channel or two-channel testing
You can choose to operate Itera II as a one-channel or a two-channel speech audiometer. To do so, select either the same input to both ears (one-channel) or select two different inputs (two-channel).

When you use two-channel testing, there are 16 possible combinations of inputs.

- **Regular one-channel monoaural testing (default)**
  CD_1 is the default input channel for right or left ears. Masking is available for the opposite ear.

- **Two-channel monoaural testing**
  This test requires special routing. See 7.3.1 Mixing input signals for two-channel monaural Speech ▶ 80.

Adjusting input sensitivity
You can adjust the strength of the input signal:

1. Press and hold the selected input button and use the **right LEVEL** selector while you check the bar indicator at the bottom of the display.
2. Make sure that the speech signal is reproduced correctly with the dB value stated in the display: the VU meters must move into line with "0 dB" on the VU meter scale.

7.1.2 Selecting masking for speech audiometry

If you select masking, the masking signal is displayed in the first line of the display. You can select

- Speech noise (SPN), or
- White noise (Wide Band Noise - WBN).

To adjust the masking signal type selection, select **SETUP**, 11 SPEECH MASK. SIG. ▶ 104.

7.1.3 The counter function in speech audiometry

There are three ways of counting words in a Speech test. To select the counting method, select **SETUP**, 12 SPEECH COUNT ▶ 104.

Use the **right LEVEL** selector to select the counting method.

1. OK Words (5-25)
   Press **PASS** to count words heard.
2. FAIL WORDS (5-25)
   Press **FAIL** to count unheard words.
3. OK & FAIL WORDS
   Here you can press both **PASS** and **FAIL** to count heard and unheard words with the advantage that you do not need to listen to the whole list of words, nor state the number of words in the list.

Selecting number of words in list

- Use the **FREQUENCY** selector to select the number of words (5 - 25) in the list.

Resetting the counter value

- If you change the dB level, the counter value will be reset for starting a new test.

Important · *Be careful not to change the dB level before you have made a note of the results.*

7.1.4 Interrupting the speech signal

- You can interrupt the speech signal by deactivating the **REVERSE** button.

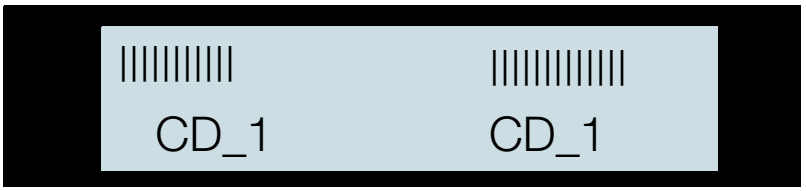
Note · *There are no interrupt buttons in Speech mode, since they are used for counting words.*

7.2 Binaural Speech Test

In Binaural Speech testing, a stimulus is presented to both ears. This may be as a single signal (one-channel), or as two different signals (two-channel).

- To perform a standard one-channel Binaural Speech test, select Speech Test and press twice on **L <--> R**.
  The input signal currently selected in monaural is also set as input on the opposite side as default.

  This means that if the monaural input was the left CD input channel (CD_1), and binaural is selected by pressing **L <--> R**, then the left CD input channel (CD_1) is also assigned to the right ear:



  To change the input channels, see 7.1.1 Selecting input ▶ 75.

7.2.1 One-channel or two-channel Speech testing

To select one or two input channels, see 7.1.1 Selecting input ▶ 75.

You can choose to operate Itera II as a one-channel or a two-channel Speech audiometer. To do so, select either the same input to both ears (one-channel) or select two different inputs (two-channel).

- **One-channel binaural testing (default)**
  CD_1 is the default input channel for *both* ears. If you wish to use CD_2 for one-channel testing, you must change both input channels.

  The stimulus level is interlocked and cannot be adjusted separately.

  Masking is available on the audiometer.

- **Two-channel binaural testing**
  Select two different input channels, one for each ear.

  The stimulus levels can be adjusted independently.

  Masking is available on the audiometer.

7.2.2 Adjusting input sensitivity

You can adjust the strength of the input signal:

1. Press and hold the selected input button and use the **right LEVEL** selector to adjust the strength of the input signal in the channel which is flashing on the display.
2. Press **L <--> R** to toggle to the opposite input channel to be able to adjust its sensitivity. To calibrate the speech signal, the VU meters must move into line with "0 dB" on the VU meter scale.

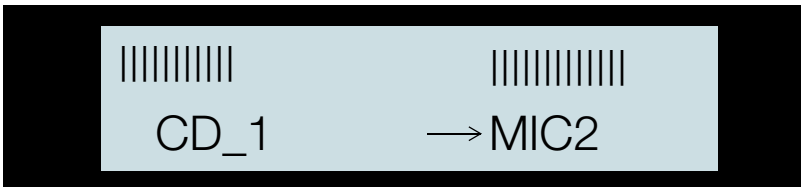
7.3 Special Speech routing

7.3.1 Mixing input signals for two-channel monaural Speech

Note · *If masking noise is switched on, the input signals cannot be mixed (see 7.3.3 Binaural Speech with masking ▶ 81).*

If you press and hold **CD** or **MIC** and then press **L <--> R**, the selected test input source is sent to the left ear, indicated by an arrow from right to left.

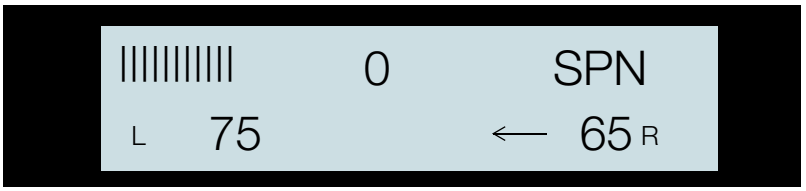
- Press once more to send the input to the right ear.



- Press once more to send the input to each ear in the normal way. The arrow disappears.

7.3.2 Speech in Noise

Adjusting the masking dB level
To adjust the masking dB level, use the **LEVEL** knob on the masking side to select.



Switching masking noise to other ear
To toggle the masking noise to the other ear press **L <--> R**. This lets you switch the masking noise to the same side as the speech signal.

An arrow appears, pointing to the ear to which the masking is to be presented.

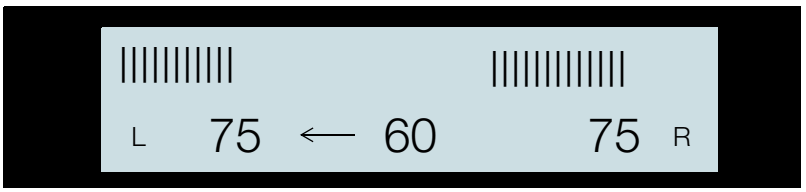
Masking noise in both ears
To transmit the masking signal to both ears, press and hold **MASK ON** and then press **twice** on **L <--> R**. To disable this setting, press **twice** on **L <--> R**.

When the masking signal returns to normal (contralateral) masking (i.e. when you press **MASK OFF** or press **L <--> R**), the arrow(s) disappears.

Note · *Binaural masking is not possible in BC testing.*

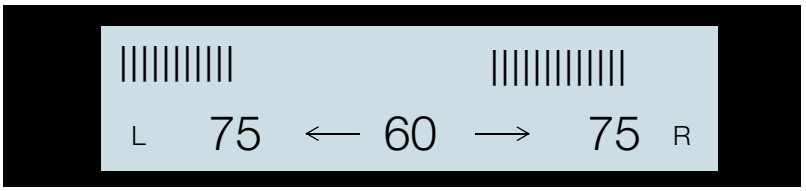
7.3.3 Binaural Speech with masking

1. To switch on masking noise, press **MASK ON**. **MASK LOCK** cannot be selected.
2. By default, masking noise is transmitted to both ears, but you can select the masking ear: press and hold **MASK ON** and press **L <--> R** *once* to send the masking noise to the left ear only.



- Press **L <--> R** *once more* to send the masking noise to the right ear only. This is how you switch between left and right ear.

- Press twice on **L <--> R** to send the masking noise to both ears.



7.3.4 Masking level for Binaural Speech

Turn the **FREQUENCY** knob to set the masking dB level.

For a description of how to test a patient and record an audiogram, see 6 Tone Testing with MADSEN Itera II ▶ 65.

8 Special tests with MADSEN Itera II

1. Prepare the patient for testing as described in 5 Preparing MADSEN Itera II for the test ▶ 59.
2. If you press **SPECIAL**, the available special tests are shown in groups of three. To select the required test, press the relevant function key below the test name. If **SPECIAL** flashes, more tests are available.

   If Itera II features more than three special tests (depending on the software version), press **SPECIAL** twice to see more tests.

   The three tests last used will always be displayed first when you press **SPECIAL**.

8.1 MCL tone testing

To test for MCL (Most Comfortable Level) using tones:

- Press **SPECIAL** one or more times, and press the appropriate function key to select.

  No masking – the stored value symbol is **M** (No response cannot be stored).

8.2 UCL tone testing

To test for UCL (UnComfortable Level) using tones:

- Press **SPECIAL** one or more times, and press the appropriate function key to select.

  No masking – the stored value symbol is **U** (No response cannot be stored).

8.3 SISI Test

The SISI (Short Increment Sensitivity Index) test consists of brief, random increments in intensity.

The dB increments are presented randomly at intervals of 4 to 6 seconds, and the permitted response time is 2 seconds.

1. Press **SPECIAL** one or more times until SISI appears and press the appropriate function key to select the test. The following display appears:

   The top line shows the intensity (dB HL) to which the increments have been added, the test name, and the current SISI % score.

   The bottom line shows the number of dB increments currently transmitted, the test tone frequency and the scale of the SISI dB increments.

2. Set the number of increments for the test:
   Press **SETUP** once and use the **right LEVEL** knob.
3. To start the SISI test press the **START/STOP** button.

   The test stops automatically when the selected number of steps in intensity has been reached, and a beep is heard.

Automatic scoring of responses
The percentage of correct responses (% score) is updated automatically.

Short increment indication
The presence of a short increment in intensity is indicated by the little **L** or **R** test ear indicator in the display changing momentarily to a rectangle, ■.

Scoring of responses
- The patient must use the Patient Response switch to register each increment that has been heard.
- Manual scoring
  If the patient is unable to use the Patient Response button, but registers an increment heard in another way, you can press **PASS** (**right INT** button) to indicate that the tone was heard.

Pausing the test
- You can pause the SISI test by pressing **START/STOP** again. During the pause "SISI" will flash in the display. To resume the test press **START/STOP** once more.

Aborting the test

- During a pause, you can *stop the test completely* by pressing **ERASE**. Select **Yes** to erase all SISI data and stop the test completely, or **No** to retain SISI data and resume the test.

Restarting the test

- If you press **ERASE** when the test is in progress. Select **Yes** to erase data. The counter is reset to zero and the test will start again from the beginning.

Changing the dB level

- To change the dB level use the **left LEVEL** knob.

Changing the dB increments

- To change the dB increments use the **right LEVEL** knob (0.25 - 5dB).

  If you do so while the test is in progress, the counters are reset to zero and the test starts again from the beginning.

Changing number of increments

- To change the preset number of SISI dB increments transmitted during a test (10-50) press **SETUP** once and use the **right LEVEL** knob. Then press **SETUP** again to implement the new setting. While the SISI test is in progress, it is not possible to change the frequency or the number of dB increments.

8.3.1 Masking during SISI

Masking

- To perform masking, press **MASK ON** or **LOCK**.

  When you hold down the button, the masking intensity (instead of % score) and signal type are displayed.

Intensity

- To change the intensity press and hold the button and turn the **right LEVEL** knob.

Signal type

- To change the signal type press and hold the button and turn the **left LEVEL** knob.

8.3.2 Using STORE in the SISI test

Note · *A maximum of four different sets of SISI values can be stored for both left and right ear.*

Storing results

- When the test is completed for a frequency, press **STORE** to store:

SISI % score, number of dB increments administered,
dB increment,
dB level for test signal and masking signal (if applicable).

An * symbol appears by the frequency and an x/o symbol for the left or right side.

- Test the next frequency.

8.4 ABLB (Fowler)

In the ABLB (Alternate Binaural Loudness Balance) test, also known as the Fowler test, a tone is transmitted at the same frequency to the left and right ear *alternately*. The patient must decide when the same volume is achieved in both ears. The patient can indicate this by pressing the Patient Response switch.

1. To select the Fowler test press **SPECIAL** once or more until ABLB appears.
2. Press **ABLB** once, and a display similar to the following will appear:

The top line shows the intensity for Right and Left channel and the test name.

The frequency of the test tone and the rate of alternation from ear to ear and back again (the alternating frequency) appear on the bottom line.

Changing alternating frequency

To change the alternating frequency:

1. Press **SETUP** once and use the **right LEVEL** knob (0.25 - 2.5 Hz).
2. Press **SETUP** again to implement the new setting.
3. You can present the signal in two ways:
   - present the signal to the patient by pressing the **INT** button, or
   - press the **REVERSE** button to present the signal continuously. You can then interrupt the test signal by pressing the **INT** button.

Signal presentation (normal/**REVERSE**) follows the normal rules (see 3.2.23 Left INT button (FAIL) ▶ 31).

8.4.1 Using STORE in the ABLB (Fowler) test

Storing equal volume values
Press **STORE** to store values of "equal volume".

- You can store up to five sets of measurements for each test frequency.
  If you try to save more than five sets of measurements for a given frequency, Itera II displays the message "No more STORE".

- You can store a maximum of four test frequencies, which you can select.
  If you have stored two or more measurements at the same frequency, you can turn the frequency knob to step through each of these measurements in turn before changing to the next frequency.

Deleting individual measurements
- To delete an individual measurement press **ERASE** once while the measurement is displayed. Other measurements at the same frequency and at other frequencies remain unaffected.

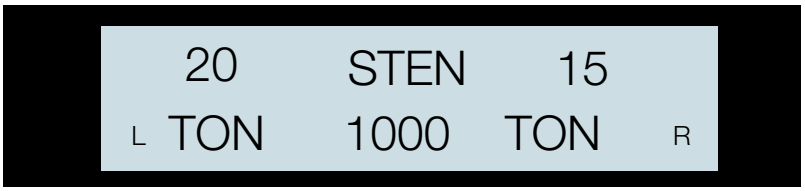
If you change the signal type
If you start a test, and data are stored, you cannot just change the signal type. If you do so, the system will refuse to save data. The message "Not allowed" is displayed and the button(s) that has/have been wrongly set flash in the correct position (three short flashes).

Masking
Itera II cannot perform masking during an ABLB Test.

8.5 STENGER Test

The Stenger Test is used to reveal a unilateral non-organic hearing loss in one ear.

1. Before you perform a Stenger test, measure the patient's tone thresholds for the left and right ears.
2. To select the Stenger test press **SPECIAL** (one or more times) until "STEN" appears.
3. Select the test by pressing **STEN** once. The following display appears:



A tone is transmitted at the same frequency on the left and right sides simultaneously.

The display shows the signal selected as stimulus. This is either TON, WRB or NBN. To change the stimulus, see Changing stimulus ▶ 88

4. Press either of the **INT** buttons to present the tone to the patient.

Changing dB level

5. You can change the dB level setting separately for the right and the left ear: Set the dB level to 10 dB above the threshold in the better ear, and 10 dB below the threshold in the poorer ear.
6. You can present the signal in two ways:
   - present the signal to the patient by pressing the **INT** button, or
   - press the **REVERSE** button to keep the signal continuous. You can then interrupt the test signal by pressing the **INT** button.

   Signal presentation (normal/**REVERSE**) follows the normal rules (see 3.2.23 Left INT button (FAIL) ▶ 31).

Changing stimulus

7. You can change the stimulus type from pure tone to Warble (WRB) or Narrow Band Noise (NBN). When you deactivate these stimulus types, the stimuli return to pure tone (TON).
   - Press **WARBLE** to activate or deactivate (see 3.2.4 The SIGNAL column ▶ 22);
   - Activate Narrow Band Noise (to activate press **MASK ON** or **MASK LOCK**, to deactivate press **MASK OFF**). See 3.2.18 The MASK column ▶ 28.)

     If you use the **MASK LOCK** function to select Narrow Band Noise, you lock together the **L** and **R** levels.

8.6 Hearing Instrument Simulation (HIS)

You can use this function to demonstrate how a hearing instrument will sound.

Follow the steps described in 8.6.1 The HIS procedure ▶ 89.

A brief description

Itera II provides an immediate way to demonstrate what big help amplification can be. For this purpose, the basic simulation described below is quite sufficient in most cases.

The filter caracteristics are applied automatically in HIS, depending on the shape of the audiogram. The following is a description of the HIS approach:

1. High and low frequency filters are applied to match the slope of the audiogram.
2. The steepness of the audiogram slope in dB/octave is calculated, and the HIS is set to about half this approximated slope (*according to half gain rule*) using either 6 dB (less steep slope), 12 dB (medium steep slope) or 18 dB (steep slope).
3. The frequency where the most amplification is wanted (4 kHz is the highest available) is identified, and the cut-off frequency is set accordingly.
4. A gain is set to approximate half the hearing loss at the frequency selected in step 3 (half gain rule again).
5. Apply the simulation, and ask the patient whether it is comfortable or too loud or soft and adjust the reference level accordingly.

Make yourself familiar with the process before using it on the patient.

8.6.1 The HIS procedure

Connect accessories

- Connect the various accessories you will be using for the HIS test to Itera II.

Audiogram

- Use an audiogram stored in Itera II.

or

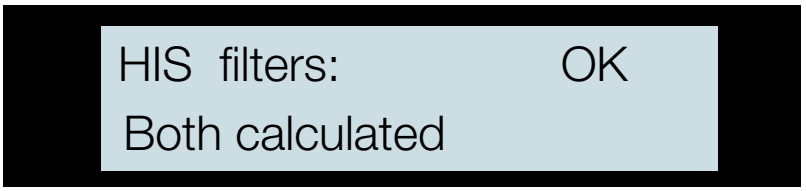
- Enter an audiogram in Itera II.

Prepare the patient

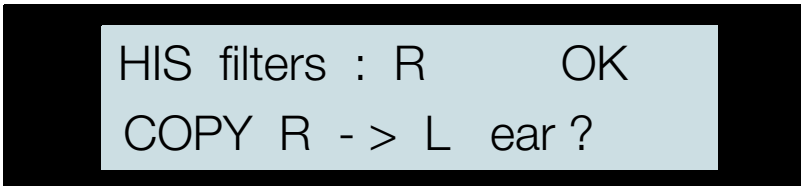
- Prepare the patient for the simulation, for instance by fitting headphones on the patient, and explain the process.

Select test

- Press **SPECIAL** (twice, if required) until **HIS** is shown on the display.
- Press the **appropriate function key** to select HIS.
- One of the following messages will appear:



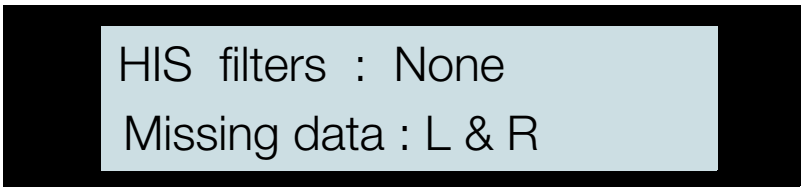
Sufficient audiograms are available for both ears



Sufficient audiogram is available for one ear only (in this case the Right ear).

Press **Yes** to copy the right audiogram to the left ear.

If you select **No**, in this example the Hearing Instrument Simulation will be made for the right ear only.



No sufficient audiograms are available. Enter the audiogram(s) manually or set the HIS filters manually (8.6.3 Manually adjusting the HIS filters ▶ 93).

- To continue, press either one of the **INT** buttons.

Adjust input sensitivity

- Adjust the input sensitivity (7.2.2 Adjusting input sensitivity ▶ 79).

Start the Hearing Instrument Simulation

- You are now ready to start the simulation.
- The default settings for the simulation are:

Transducer	AC Alternately SF
Input	**MIC** (live speech) Alternately CD (7.2.1 One-channel or two-channel Speech testing ▶ 79)

HIS reference level	65 dB SPL The level for normal speech considered for a person with normal hearing is around 65 dB SPL. Alternately: See Adjust HIS reference level ▶ 91

- To start the simulation, press **START/STOP**.

Adjust HIS reference level

- Adjust the HIS reference level. The level for normal speech considered for a person with normal hearing is around 65 dB SPL.
  - Press **SETUP** once to view the Reference Level, for instance 65 dB.
  - To change this Reference Level for the HIS test, press **SETUP** once.
  - The lower line of this display will show "Ref. 65 dB SPL", and from here you can change the setting to any level between 50 and 80 dB. To do so use the **right LEVEL** selector *within three seconds*.

    This Reference Level is displayed in SPL.

    The effect of the HIS filters is to increase the level by their respective amplification factors at low and high frequencies.

    When the display shows "L 0 -HIS- 0 R", the zeros indicate that the hearing level corresponds to the Reference Level over the entire frequency range. To change this, see Adjusting HIS "Master Volume" ▶ 92.

Muting the simulator

- If required, you can temporarily mute the output: Press **REVERSE** to deactivate the output (the button indicator turns off).

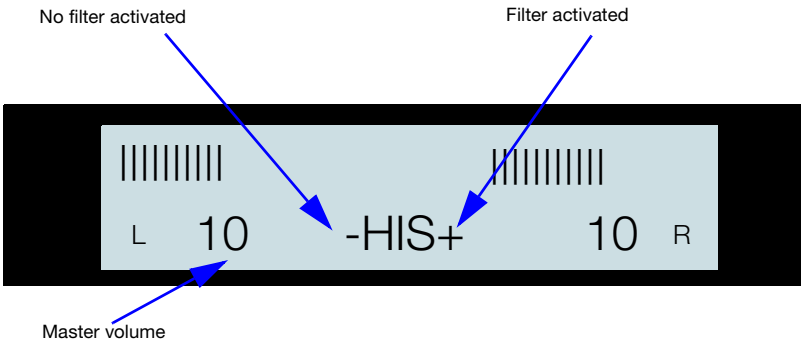
  Both **OUTPUT indicators** light up automatically.

Simulating amplification

- The HIS always starts in unsimulated mode. The display shows **-HIS-** to indicate that the simulation filters are not activated. This means that the sound is presented without simulated amplification.
- Starting simulation

  To start simulating, you must activate the HIS filters by pressing the **START/STOP** button. To show the benefit of a hearing instrument, use the **START/STOP** button to switch between simulating and not simulating the amplification.

- The display shows a **+** symbol for the ear where a simulation filter is activated.



Adjusting HIS "Master Volume"

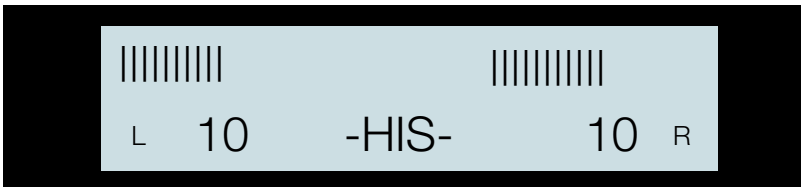
Note · *The system automatically sets the Master Volume.*

- Increasing the output level manually

You can manually increase the output level by adding to the Reference Level.

- Use the **right** and **left LEVEL** knobs to change the "Master Volume" as follows:
  - The Master Volume for left and right ears are locked together as default. **MASK LOCK** is lit.
  - Use the **left or right LEVEL** knob to control the "Master Volume" for both ears together.
  - If you wish to control the "Master Volume" for the two ears individually, press **MASK LOCK** to deactivate the locked function.

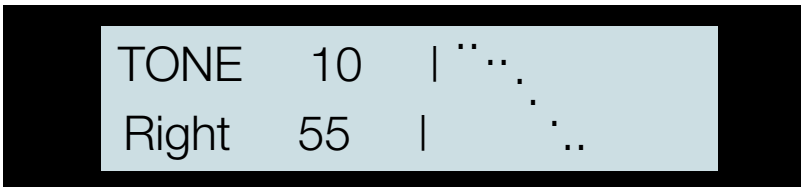
Example:



Sound level =Ref. level + 10 = 65 + 10 = 75 dB SPL in both ears.
None of the filters is active.

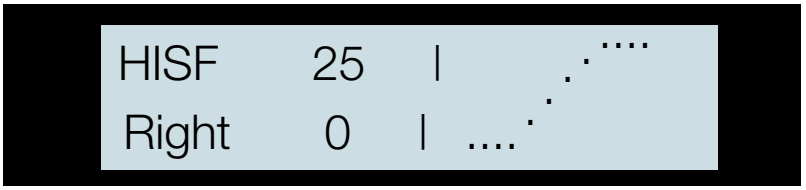
8.6.2 Viewing thresholds and filters

1. You can use the **FREQUENCY** knob to view stored thresholds and resulting filters graphically.



Note · *The aspect ratio displayed is scaled, based on the audiogram thresholds listed at the beginning of this example.*

TONE denotes AC
BONE denotes BC
HISF denotes Hearing Instrument Simulator Filter.



2. If the simulation is not satisfactory, use the manual procedure described in 8.6.3 Manually adjusting the HIS filters ▶ 93 to further adjust.

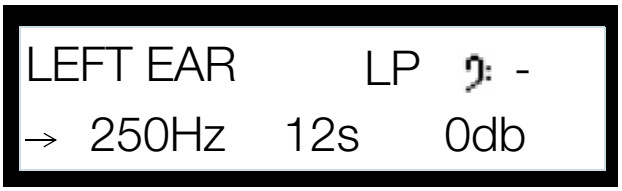
8.6.3 Manually adjusting the HIS filters

The filters are in series, but could theoretically still be set to simulate a three band hearing instrument by selecting different cut-off frequencies and adjusting the different gains and the reference level.

Note · *In the standard automatic HIS setup described in 8.6.1 The HIS procedure ▶ 89 this is done automatically.*

To be able to change the HIS filter parameters for the left or right ear, press either the **left** or **right INT** button. This will display the filter characteristic for the selected ear as shown below:

Top line
Second line



The top line
The top line shows the selected ear and shows whether the currently displayed parameters apply to the low pass (LP) or high pass (HP) filter.

The second line

The second line shows the filter's 3 dB cut-off frequency, the filter slope (in dB per octave) and the (asymptotic) amplification at the filter cut-off frequency.

Changing values

The arrow points to a setting which you can change. To change a setting:

- Use the **left LEVEL** knob to move the arrow to the required setting.
- Use the **right LEVEL** knob to change the setting.
  Moving the arrow also steps between the LP and HP filters.

When you have set up the filter values, press the relevant **INT** button to return to the normal HIS screen.

You can press the **START/STOP** here, and the filters are updated online if you change a value while the filter is activated.

Parameter	LP filter frequencies	HP filter frequencies
Cut-off frequency	250, 500, 1000, 2000 Hz	1000, 2000, 3000, 4000 Hz
Slope	6, 12, 18 dB/octave	6, 12, 18 dB/octave
Gain above a selectable reference level	0, 5, 10, 15, 20, 25 dB	0, 5, 10, 15, 20, 25 dB

See • Starting simulation ▶ 91, and • Increasing the output level manually ▶ 92 to continue the procedure.

Filter examples

Any filter whose amplification is set to 0 dB has no effect.

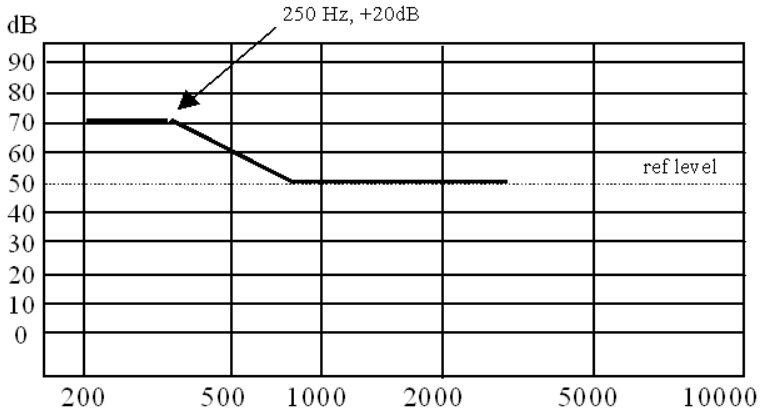


Fig. 12 Low pass filter graph

Fig. 12 ▶ 95 shows a graph where the characteristics of a low pass (bass) filter are set to an amplification of +20dB for frequencies under 250 Hz.

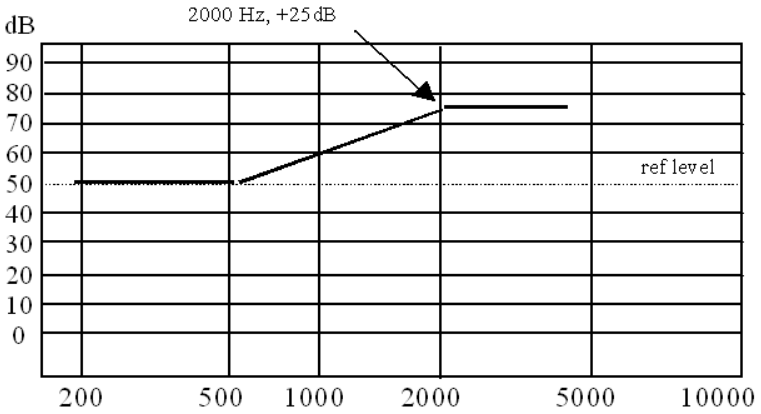


Fig. 13 High pass filter graph

Fig. 13 ▶ 95 shows a graph where the characteristics of a high pass (treble) filter are set to an amplification of +25dB for frequencies over 2000 Hz.

8.7 Overview of Monaural/Binaural Test signals and the Masking side

	Test signal		Masking signal	
	Monaural	Binaural	Ipsi	Contra
THR	X			X
SPEECH	X	X	X	X
SISI	X			X
ABLB		X		
STEN		X		
HIS		X		

Fig. 14 Monaural/binaural test signals and masking side

9 Managing Data and Results

9.1 Transferring test results from the audiometer to the PC

To transfer test results from your audiometer:

- Switch on the audiometer.
- In the OTOsuite Audiometry Module select **Tools > Fetch Test Results...**

Follow the onscreen instructions.

9.2 Storing data

You can store one set of AC data and one set of BC data, including thresholds for each frequency.

You can delete these thresholds one by one or collectively.

You can transfer these data to a pc with the OTOsuite Audiometry Module.

9.3 Printing results

Audiograms that have been saved in the OTOsuite Audiometry Module can be printed from the pc.

10 Setup of MADSEN Itera II Parameters

10.1 What does SETUP do?

You can define all of the Itera II's normal parameters and setups under **SETUP**.

Permanent changes
You can change the parameters permanently and save them in a specific test setup of your choice

- 10.2.1 Permanent changes in the setup ▶ 99
- 1 SAVE TEST SETUP ▶ 102

Temporary changes
You can make temporary changes to the various parameters during a test. These changes will not be saved.

- 10.2.3 Temporary changes in the setup ▶ 100

10.2 How to use SETUP

10.2.1 Permanent changes in the setup

1. To access changing your parameters press twice on **SETUP**.

   When the **SETUP** function is active, the **SETUP indicator light** flashes. Most other buttons are deactivated and audiometry cannot be performed.

2. Turn the **left LEVEL** selector to select the parameter item you wish to change. When you select a new item, the item number is displayed briefly in the bottom line, for instance:

   Item 5

   As a rule, the top line in the display contains a description of the current parameter, for instance:

   SF TRANSDUCER

The bottom line contains the value that you can change. The values available are shown one line at a time, for instance:

---- (None)
HDA 200
TDH39
EAR-T. (E-A-R-TONE®3A)
F.F.

3. To change the actual parameter value, for most items, use the **right LEVEL** selector.
4. Changes made under **SETUP** will be saved when you leave **SETUP**, and will apply the next time Itera II is switched on.
5. The most recently selected item will also be the one displayed the next time you activate **SETUP**.
6. To exit this function press twice on **SETUP**.

10.2.2 Return to default settings

To return to the default settings, see 38 DEFAULT SETTING ▶ 112.

10.2.3 Temporary changes in the setup

ShortCuts
ShortCut is a faster way to access some of the parameters. Changes made to parameters via *ShortCut* will not be saved when Itera II is switched off.

- Warble frequency ▶ 22
- Warble modulation ▶ 22
- Pulse frequency ▶ 22
- Test signal duration ▶ 22
- Input signal sensitivity, MIC/CD ▶ 23
- Output level, headphone ▶ 25
- Fixed dB level, talkover level ▶ 25
- MIC sensitivity ▶ 25
- Talkover signal to headphone ▶ 25
- Setup - volume ▶ 28
- Masking transducer selection ▶ 29
- Masking noise in Speech ▶ 29
- Display graphs, HIS mode ▶ 29
- Warble modulation ▶ 30
- Signal type, SISI ▶ 30
- Master volume, HIS ▶ 30

- Parameter selection, SETUP ▶ 30
- Talkback level ▶ 30
- Warble modulation, amplitude ▶ 30
- Pulse frequency ▶ 30
- Impulse time ▶ 30
- Input sensitivity, speech ▶ 31
- Word counting method, speech ▶ 31
- Alternating Fowler frequency ▶ 31
- Master volume, HIS ▶ 31
- Parameter selection, SETUP ▶ 31
- Power out voltage ▶ 31

10.3 SETUP items

SETUP items:

1 SAVE TEST SETUP ▶ 102
2 SET DEF. TEST P. ▶ 102
3 AC TRANSDUCER ▶ 102
4 BC TRANSDUCER ▶ 102
5 SF TRANSDUCER ▶ 103
6 AC MASKING ▶ 103
7 BC MASKING ▶ 103
8 SF MASKING ▶ 103
9 MASK. PRESENT. ▶ 103
10 TONE MASK. SIG. ▶ 104

11 SPEECH MASK. SIG. ▶ 104
12 SPEECH COUNT ▶ 104
13 FREQ.CH.AT STORE ▶ 104
14 DB LEV. NEW TRA. ▶ 106
15 DB LEV. NEW FREQ ▶ 106
16 PULSE FREQUENCY ▶ 108
17 IMPULSE LENGTH ▶ 108
18 WARBLE MOD. SIZE ▶ 108
19 WARBLE FREQUENCY ▶ 109
20 SELECT AC FREQ. ▶ 109

21 SELECT BC FREQ. ▶ 109
22 SIGNAL UNIT ▶ 109
23 MIC INPUT SENSE ▶ 109
24 CD INPUT SENSE ▶ 109
25 TALK OVER ▶ 110
26 TALK BACK MIC. ▶ 110

27 MONITOR ON/OFF ▶ 110
28 MONITOR LEFT ▶ 110
29 MONITOR RIGHT ▶ 110
30 LIGHT INTENSITY ▶ 110

31 INTERNAL BEEP ▶ 110
32 EXT. RANGE ▶ 111
33 EXT.R. dB-SPACE ▶ 111
34 BAUDRATE ▶ 111
35 CD POWER SUPPLY ▶ 111
36 DISPLAY ▶ 111
37 STIMULI KNOB ▶ 112
38 DEFAULT SETTING ▶ 112

Save test setup

1 SAVE TEST SETUP

Here you can save a test setup, e.g. masking ON, signal type WARBLE and presentation REVERSE, so that this setup is used next time the device is switched on. This can be saved, and when the device is next switched on, these settings will be selected automatically. To use this item, press **STORE**.

Note · *When Itera II is switched on and you choose between various tests, the Itera II will always revert to the setup last used for a given test.*

Set default test parameters

2 SET DEF. TEST P.

Activates Itera II's default setting for the relevant test. All settings are set to the "default" values; for example, for the THR test the setting will be as follows: signal="TONE", mask="OFF", dB="5", etc.

If this setting is to apply next time Itera II is switched on, go to 38 DEFAULT SETTING ▶ 112 afterwards. To use this item, press **STORE**.

AC transducer

3 AC TRANSDUCER

Choose between calibrated headphones

---- (None)
HDA 200
TDH 39
EAR-T. (E-A-R-TONE® 3A)

Note · *If the wrong headphone is selected compared to the one that is physically connected to Itera II, the measurements will be incorrect!*

BC transducer

4 BC TRANSDUCER

Choose between calibrated bone conductors:

---- (None)
B-71M (Mastoid)
B-71F (Forehead)

SF transducer

5 SF TRANSDUCER

Choose between calibrated headphones/free-field loudspeakers:

---- (None)
HDA 200
TDH39
EAR-T. (E-A-R-TONE® 3A)
F.F.

AC masking

6 AC MASKING

Select masking transducer for AC:

---- (None)
AC TRANSDUCER
BC TRANSDUCER
SF TRANSDUCER

BC masking

7 BC MASKING

Select masking transducer for BC

---- (None)
AC TRANSDUCER
SF TRANSDUCER

SF masking

8 SF MASKING

Select masking transducer for SF

---- (None)
AC TRANSDUCER
BC TRANSDUCER
SF TRANSDUCER

Masking presentation

9 MASK. PRESENT.

Set mode for masking interrupter:

CONTINUOUS	• The masking signal is always present
FREE NORMAL	• The masking signal follows the right interrupter - present when button is pressed.
FREE INVERSE	• The masking signal follows the right interrupter - disappears when button is pressed.

LOCKED NORMAL
- The masking signal follows the right and left interrupter -present when button is pressed.

LOCKED INVERSE
- The masking signal follows the right and left interrupter - disappears when button is pressed.

Tone masking signal

10 TONE MASK. SIG.
Select masking stimulus for Tone Test

NBN
WBN

Speech masking signal

11 SPEECH MASK. SIG.
Select masking stimulus for Speech Test

SPN
WBN

Speech count

12 SPEECH COUNT
Select number of words in a list, and select counting method. For further details, look under speech audiometry in 7 Speech Audiometry with MADSEN Itera II ▶ 75.

OK & FAIL WORDS
FAIL WORDS (5-25)
OK WORDS(5-25)

Frequency change at STORE

13 FREQ.CH.AT STORE
Method for frequency change when you press **STORE**.

NO CHANGE (the frequency remains the same)
If this parameter is set to “No change”, the setting will remain for instance at 40 dB at 1000 Hz when you press **STORE**. See the following example.

	dB	Hz	
	40	1000	**Press STORE...**
...continues at	40	1000	

WRAPIf you press **STORE** at the highest possible frequency, you switch to the lowest possible frequency. At other frequencies, pressing **STORE** advances the frequency. See the following example.

	dB	Hz	
	40	1000	**Press STORE...**
...continues at	40	1500	**Press STORE...**
...continues at	40	2000	**Press STORE...**
...continues at	40	3000	**Press STORE...**
...continues at	40	4000	**Press STORE...**
...continues at	40	6000	**Press STORE...**
...continues at	40	8000	**Press STORE...**
...continues at	40	12500	**Press STORE...**
...continues at	40	125	**Press STORE...**
...continues at	40	250	**Press STORE...**
...continues at	40	500	**Press STORE...**
...continues at	40	750	**Press STORE...**
...continues at	40	1000	

BUTTERFLYIf you press the **STORE** button at the highest or the lowest possible frequency, you change to 1000 Hz.

Itera II will automatically test frequencies above 1000 Hz in ascending order, and frequencies below 1000 Hz in descending order. See the following example.

	dB	Hz	
	40	1000	**Press STORE...**
...continues at	40	1500	**Press STORE...**
...continues at	40	2000	**Press STORE...**
...continues at	40	3000	**Press STORE...**
...continues at	40	4000	**Press STORE...**
...continues at	40	6000	**Press STORE...**
...continues at	40	8000	**Press STORE...**
...continues at	40	12500	**Press STORE...**

	dB	Hz	
...continues at	40	1000	**Press STORE...**
...continues at	40	750	**Press STORE...**
...continues at	40	500	**Press STORE...**
...continues at	40	250	**Press STORE...**
...continues at	40	125	**Press STORE...**
...continues at	40	1000	**Press STORE...**
...continues at	40	1500	**Press STORE...**

dB level new transducer

14 DB LEV. NEW TRA.

Choice of initial volume level for a new transducer, or change between different tests.

NO CHANGE or adjustable in the range: -10 to 50 dB

dB level new frequency

15 DB LEV. NEW FREQ

Choice of initial intensity when changing frequency.

NO CHANGE (the frequency remains the same)
or adjustable in the range -10 to 50 dB.
See the example (with setting 13 set to WRAP):

	dB	Hz	
	40	1000	**Press STORE...**
...continues at	40	1500	**Press STORE...**
...continues at	40	2000	**Press STORE...**
...continues at	40	3000	**Press STORE...**
...continues at	40	4000	**Press STORE...**
...continues at	40	6000	**Press STORE...**
...continues at	40	8000	**Press STORE...**
...continues at	40	12500	**Press STORE...**
...continues at	40	125	**Press STORE...**
...continues at	40	250	**Press STORE...**

	dB	Hz	
...continues at	40	500	**Press STORE...**
...continues at	40	750	**Press STORE...**
...continues at	40	1000	

XX dB FIXED
New fixed value.
See the example (with setting 13 set to WRAP):

	dB	Hz	
	40	1000	**Press STORE...**
...continues at	-10	1500	**Press STORE...**
...continues at	-10	2000	**Press STORE...**
...continues at	-10	3000	**Press STORE...**
...continues at	-10	4000	**Press STORE...**
...continues at	-10	6000	**Press STORE...**
...continues at	-10	8000	**Press STORE...**
...continues at	-10	12500	**Press STORE...**
...continues at	-10	125	**Press STORE...**
...continues at	-10	250	**Press STORE...**
...continues at	-10	500	**Press STORE...**
...continues at	-10	750	**Press STORE...**
...continues at	-10	1000	

XX dB ABOVE THR
New fixed value above any previously located threshold value.
See the example (with setting 13 set to WRAP)

	dB	Hz	
	40	1000	**Press STORE...**
...continues at	30	1500	**Press STORE...**
...continues at	20	2000	**Press STORE...**

	dB	Hz	
...continues at	10	3000	**Press STORE...**
...continues at	0	4000	**Press STORE...**
...continues at	-10	6000	**Press STORE...**
...continues at	-10	8000	**Press STORE...**
...continues at	-10	12500	**Press STORE...**
...continues at	-10	125	**Press STORE...**
...continues at	-10	250	**Press STORE...**
...continues at	-10	500	**Press STORE...**
...continues at	-10	750	**Press STORE...**
...continues at	-10	1000	

With masking

	dB	Hz	Masking level	
	40	1000	30	**Press STORE...**
...continues at	30	1500	20	**Press STORE...**
...continues at	20	2000	10	**Press STORE...**

Pulse frequency

16 PULSE FREQUENCY

Choice of pulse frequency:
0.25 to 2.50 Hz

Impulse length

17 IMPULSE LENGTH

Selection of the fixed period of time during which the signal will be presented when IMPULSE mode is selected.
0.25 to 2.50 sec.

Warble modulation size

18 WARBLE MOD. SIZE

Set modulation size as a %:

1 to 25% e.g.: At 5% the signal modulates 5% in relation to default frequency

Warble frequency

19 WARBLE FREQUENCY
1 Hz to 20 Hz

Select manual frequency

20 SELECT AC FREQ.
Here you can select (ON) or cancel (OFF) the frequencies to be included for automatically changing frequencies when you store AC thresholds.

The frequencies are selected using the **FREQUENCY** selector.

ON/OFF is selected using the **right LEVEL** selector.

Note · *This setting does not influence the* **Frequency** *knob, and accordingly, all frequencies (including inter-octave frequencies) are available when you use the* **Frequency** *knob.*

However, if the frequency 125 Hz is not included in the SELECT AC FREQ. setting, then it will not be included when you use the **Frequency** knob.

Select automatic frequency

21 SELECT BC FREQ.
Here you can select (ON) or cancel (OFF) the frequencies to be included for automatically changing frequencies when you store BC thresholds.

The frequencies are selected using the **FREQUENCY** selector.

ON/OFF is selected using the **right LEVEL** selector.

Note · *This setting does not influence the* **Frequency** *knob , and accordingly, all frequencies (including inter-octave frequencies) are available when you use the* **Frequency** *knob.*

Signal unit

22 SIGNAL UNIT
HL
SPL ● LED-FLASH
If SPL is selected, the dB button will flash to indicate that the display is showing SPL values and not HL values.

Microphone input sensitivity

23 MIC INPUT SENSE
Selection of microphone input sensitivity (MIC LED is lit).

If you press and hold **MIC**, you can adjust the left microphone with the **left LEVEL** selector and the right microphone with the **right LEVEL** selector.

If you turn the **right LEVEL** selector *without* pressing **MIC**, both right and left microphones are adjusted and the display shows an average of the two.

CD/Tape input sensitivity

24 CD INPUT SENSE
Selection of CD/Tape input sensitivity (CD LED is lit).

If you press and hold **CD**, you can adjust the left input with the **left LEVEL** selector and the right input with the **right LEVEL** selector.

If you turn the **right LEVEL** selector *without* pressing **CD**, both right and left inputs are adjusted and the display shows an average value.

Talk over

25 TALK OVER
(EXTERN if external microphones connected, otherwise INTERN)

Possible settings:
Frequency selector:
Switches between dB level fixed (FIX) or dB level relative to any saved threshold value (THR) for frequencies 250, 500, 1000, 2000, 4000 Hz.

L <--> R button: Sends the Talk Over signal to the right or left headphone. Press twice to transmit the signal to both ears.

When you press and hold **TALK OVER**, the following adjustments can be made:

Left LEVEL selector:Output level in headphone (dB HL)

Right LEVEL selector:Microphone sensitivity for Talk Over.

Talk back microphone

26 TALK BACK MIC.
Selection of sensitivity for Talk Back microphone.

Monitor ON/OFF

27 MONITOR ON/OFF
Switches the monitor ON or OFF.

Tone/Speech/Masking:Choose the stimulus using the **FREQUENCY** selector.

On/Off:Enable/disable monitoring of the chosen stimulus using the **right Level** selector.

Monitor left

28 MONITOR LEFT
Selection of volume for left monitor.

Monitor right

29 MONITOR RIGHT
Selection of volume for right monitor.

Light intensity in LEDs

30 LIGHT INTENSITY
Selection of brightness in LEDs (All LEDs are lit).

Internal beep

31 INTERNAL BEEP
Switches the internal beeper in connection with the patient's response switch, and under item change in SETUP, ON or OFF.

Fault beeps are not removed

Extended range timeout

32 EXT. RANGE

Selection of one of three modes (see description in 3.2.14 The EXT. RANGE button ▶ 26):

- Auto
- Manual
- Timeout
  Selection of the time interval that passes between the device standing untouched and the EXTended (sound intensity) RANGE is deactivated.
  If OFF is selected, this safety feature is disabled.

  Selectings possibilities: OFF, 20 sec. to 120 sec.

Default: Auto.

Extended range dB-space

33 EXT.R. dB-SPACE

Selection of the sound intensity range below the maximum value for which selection of EXTended RANGE is permitted

30 dB to 70 dB below max.

Baud rate

34 BAUDRATE

Selection of baud rate for RS232 interface.

9600, 19200 (default value), 38400, 57600.

CD power supply

35 CD POWER SUPPLY

Selection of voltage for CD power supply.

OFF and 1.5 V to 10.0 V set using the **right LEVEL** selector.

Note · *Remember to use an adapter if necessary so that the CD has the correct polarity. The centre pin is + and the sheath is 0 V.*

Display

36 DISPLAY

Controls display setup. Fixes one of the four left/right configurations:

SIGNAL AS L/R

- The signal for the left ear is shown on the left side, and that for the right ear on the right side. Masking is on the opposite side.

SIGNAL AS R/L

- The signal for the left ear is shown on the right side, and that for the right ear on the left side. Masking is on the opposite side.

FIX SIGNAL ON L
- The signal is shown on the left side, and masking on the right side.

FIX SIGNAL ON R
- The signal is shown on the right side, and masking on the left side.

Stimuli knob

37 STIMULI KNOB

Controls the functions of the **left** and **right LEVEL** knobs:

FIX SIG. TO L
- The signal is controlled by the **left LEVEL** knob and masking by the **right LEVEL** knob.

FIX SIG TO R
- The signal is controlled by the **right LEVEL** knob and masking by the **left LEVEL** knob.

FOLLOW DISPLAY
- The stimuli (signal/masking) controlled by the **left** and **right LEVEL** knobs correspond to the placing (left/right) of the stimuli on the display.

Default setting

38 DEFAULT SETTING

Sets all SETUP parameters to default.

Press **STORE**.

The default values are:

3: AC TRANSDUCER	None
4: BC TRANSDUCER	None
5: SF TRANSDUCER	None
6: AC MASKING	None
7: BC MASKING	None
8: SF MASKING	None
9: MASK.PRESENT.	Continuous
10: TON MASK. SIG.	NBN
11: SPEECH MASK. SIG.	SPN
12: SPEECH COUNT	FAIL WORDS 20
13: FREQ.CH.AT STORE	WARP
14: DB LEV. NEW TRA.	20 dB
15: DB LEV. NEW FREQ	No change
16: PULSE FREQUENCY	1.50 Hz

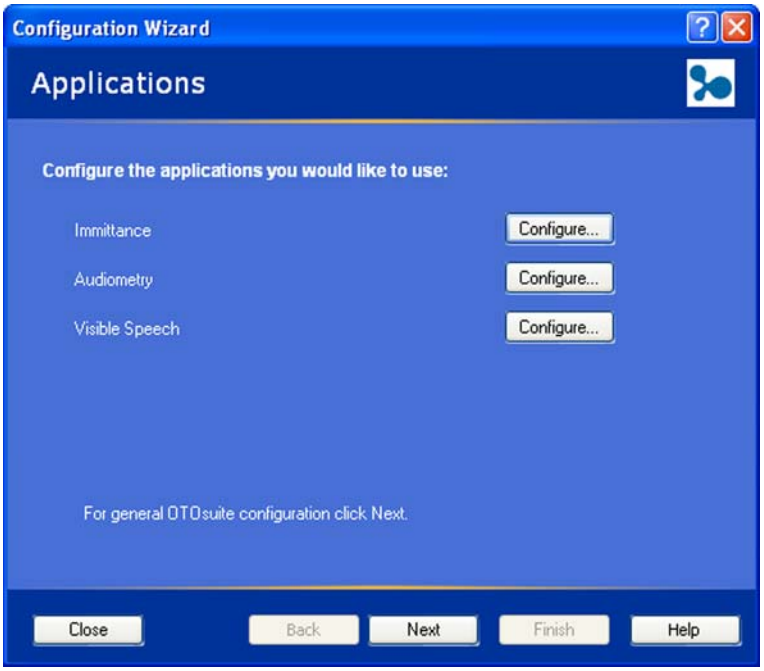
17: IMPULSE LENGTH	1.50 Sec.
18: WARBLE MOD.SIZE	5%
19: WARBLE FREQUENCY	5Hz
20: SELECT MANU.FREQ	All frequencies on
21: SELECT AUTO.FREQ	All frequencies on
22: SIGNAL UNIT	HL
23-26	Half gain
27: MONITOR ON/OFF	Tone On, Speech On, Masking Off
28 - 30	Half gain
31: INTERNAL BEEP	ON
32: EXT.R. TIMEOUT	Off
33: EXT.R. dB-SPACE	30 dB below max.
34: BAUDRATE	19200 Baud
36: DISPLAY	Fix signal on Left
37: STIMULI KNOB	Fix signal to Left

SETUP items

11 Configuring OTOsuite

The Configuration Wizard guides you through the process of customizing the various features and functions that apply to OTOsuite.

1. Select **Tools > Configuration wizard...**



2. If you wish to connect your test device to the specific module and set up module-specific functionalities, click on **Configure...** next to **Audiometry**.

11.1 Audiometry

Audiometers	
Connect to the device you wish to use for testing.	1. Click on the device you wish to use. – If the device is not listed, check the box **My device is turned on and ready to be found**, and click on **Search**. 2. The first time you select a device, you will be prompted to enter the Audiometer license key. 3. Enter the license key. 4. Select the device and click on **Next** or **Close**.

Test type	
Show SISI test type **Show ABLB test type** **Show MLD test type**	• Click to enable viewing either of these test types as a test tab selection on the Audiometry test screens, and to access their settings in **Tools > Options**. If a User Test is set up to include either of these tests, and they have been disabled in this screen, you will be prompted to enable them here.

12 MADSEN Itera II Maintenance and Safety

12.1 Service and repair

It is recommended that you keep the packing material in which the Itera II was delivered. If you need to send it in for service, the original packing material will ensure protection against damage during transport, etc.

On request, your supplier can obtain a service manual from the factory. The service manual contains electrical diagrams, descriptions, lists of components and calibration instructions, etc.

Warning · *For the sake of safety and in order not to void the warranty, the cabinet should only be opened and serviced by authorised service personnel at authorised workshops. In case of any defects, please make a detailed description of the defect(s) and contact your supplier. Do not use a defective instrument.*

Note · *There are no user-serviceable parts inside the Itera II cabinet. When dismantling the Itera II unit there is a risk of electric shock.*

12.2 Cleaning and maintenance

Itera II requires no preventive maintenance. However, it is recommended that you observe the following guidelines.

12.2.1 Cleaning the device

Make sure that the instrument is kept clean and free of dust:

- Remove dust using a soft brush, and take special care to remove any accumulations of dirt on or around the buttons on the front panel.
- To clean the cabinet and the front panel, use a soft, slightly damp cloth with a small amount of mild detergent on it. Do not allow any moisture inside the instrument!
- To clean the display, use a dry cloth or soft brush. Note that the display is laminated for maximum readability and must therefore be treated with care.

12.2.2 Cleaning accessories

Earphones
The earphones are in constant contact with your patients, and should therefore be kept clean. Wipe them regularly with a moist cloth.

Eartips
The eartips are disposable and therefore should not be cleaned or re-used. There are no special requirements for the disposal of the ear-tips.

If you use the E-A-RTONE® 3A insert phone, note that the standard yellow foam insert tips are disposable, and therefore should not be cleaned or re-used. There are no special requirements for the disposal of the insert tips.

Bone conductor
The bone conductor should periodically be wiped clean with a dry cloth.

12.2.3 Replacing fuses

To replace or inspect a fuse, proceed as explained below.

Warning ·
Risk of fire. *Before replacing a fuse, first switch off the instrument and disconnect it from the mains power supply.*

The fuse-holders are located next to the AC power connector (or they are integrated with the power connector).

To remove a fuse:

- Unscrew the end of the fuse-holder using a screwdriver with a blade at least 6 mm wide (or remove the power connector).

Fuse types
The fuse is a push-fit in the end of the fuse-holder. When you replace fuses, use only fuses of type T1A L/250 V, 5 mm x 20 mm.

12.3 Calibration

You can download new software to Itera II, and if this involves no change to the transducers, Itera II does not need recalibration.

Annual calibration
It is recommended that Itera II, headphones and bone conductors are calibrated annually by suitably qualified personnel using the appropriate equipment.

Itera II is dispatched from the factory together with a Test Report (Calibration Certificate). The Test Report specifies the transducers that have been calibrated (i.e., those which have been supplied together with the instrument), according to which standards, and the equipment used for calibration. Results are listed for each transducer at all standard frequencies.

In general, the instrument is calibrated in dB SPL or dB HL using the stated reference equivalent thresholds; dB HL are related to sound pressure levels, dB SPL = dB re 20 μPa, and force levels (dB re 1 μN).

Note · *Calibration has been performed only on the transducers supplied! If you wish to use any other transducer for testing with Itera II, please contact your local distributor first.*

13 Unpacking and Installing MADSEN Itera II

13.1 Unpacking Itera II

When you receive Itera II, it is packed in special packing material. The packing material is designed to provide your Itera II with good and safe protection during transport and shipping.

Remove the instrument and accessories carefully from the packing material. Make sure that Itera II has not been damaged during transport. Check that the items on the packing list correspond to those delivered.

13.2 Installation

Before you install Itera II

- Before you start using the device, it is recommended that you leave it at room temperature for 30 minutes - particularly if it has been stored in very cold or warm temperatures, e.g. if it has been in a car.
- Read the User Manual before you connect or use Itera II for the first time.
- Connect required accessories such as the headset, the bone conductor, and the Patient Response Switch to their respective connectors on the back panel according to the instructions in 13.2.2 Air conduction ▶ 128, 13.2.3 Bone conduction ▶ 128, 13.2.4 External microphone ▶ 129, 13.2.4 External microphone ▶ 129 and the locations described in 3.3 Socket connections - rear panel ▶ 31.

Note that the headphone (AC transducer) and SP (SF) transducer connectors and the CD/Tape sockets are color coded as described in 3.3 Socket connections - rear panel ▶ 31.

13.2.1 Location

Place the instrument in a well-ventilated location away from sources of heat.

13.2.2 Air conduction

Headphones

- Connect the right and left wires (red and blue) from the transducers to the right and left AC sockets in the back panel of Itera II (3.3 Socket connections - rear panel ▶ 31).

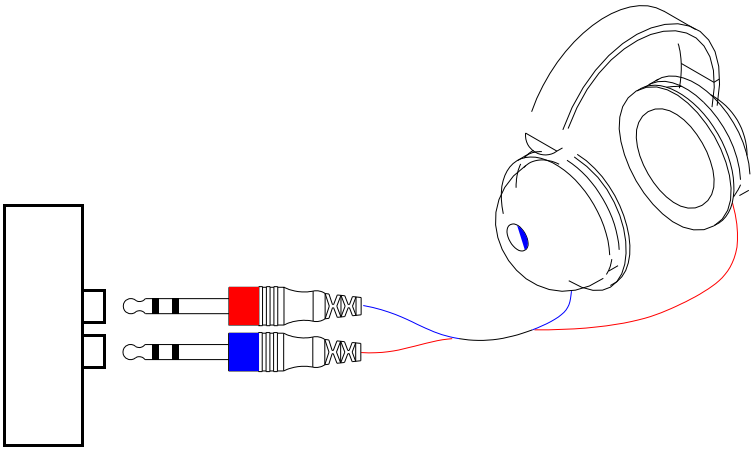


Fig. 15 Headset

Insert phones

- Connect the Insert phones to the right and left AC socket or the right and left SF socket (3.3 Socket connections - rear panel ▶ 31). They must be connected according to calibration.
- To verify the calibration, press [AC]/[SF] and the display will show the transducer calibrated for that output.

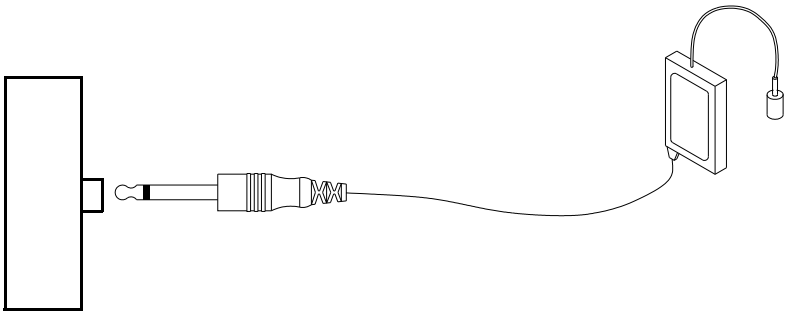


Fig. 16 EAR-3A insert phones (only one shown)

13.2.3 Bone conduction

- Connect the bone conduction transducer plug into the BC socket located in the back panel of Itera II (3.3 Socket connections - rear panel ▶ 31).

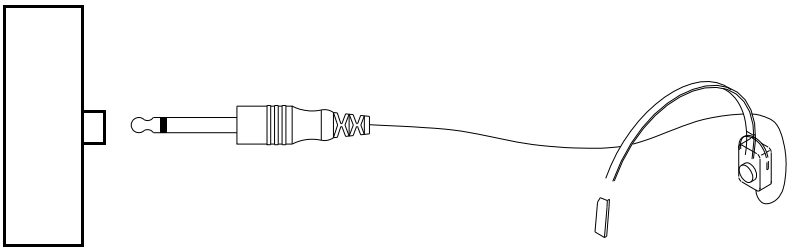


Fig. 17 Bone conductor B71

13.2.4 External microphone

In speech testing and patient communication there are two possible external microphone solutions:

- Gooseneck, or
- Boom microphone on the monitor headset.

Connect the chosen microphone solution to the "EXTERNAL MIC/MONITOR HEADSET" socket (3.3 Socket connections - rear panel ▶ 31). Connecting one of these disables the internal talk-over microphone.

Gooseneck

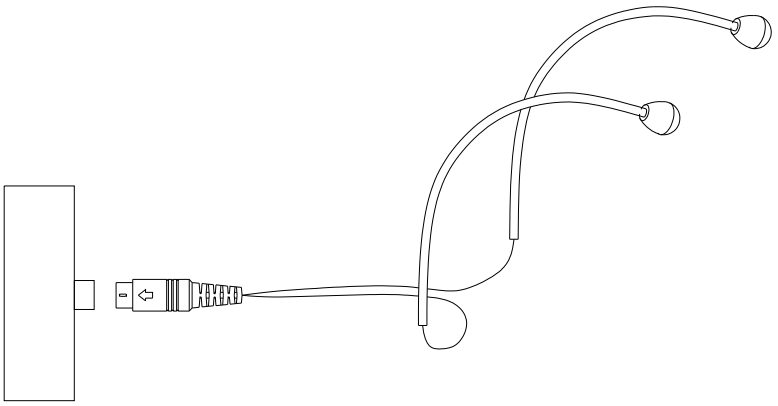


Fig. 18 Gooseneck microphones

Monitor headset

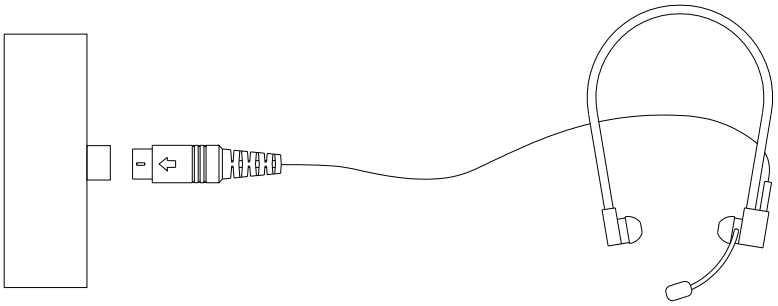


Fig. 19 Monitor headset with boom microphone

13.2.5 Free Field

Without Power Amplifier

- Plug the Free Field transducer cables directly into the R-SF and L-SF sockets located in the back panel of Itera II (3.3 Socket connections - rear panel ▶ 31). The sound is then routed out through sound field speakers.

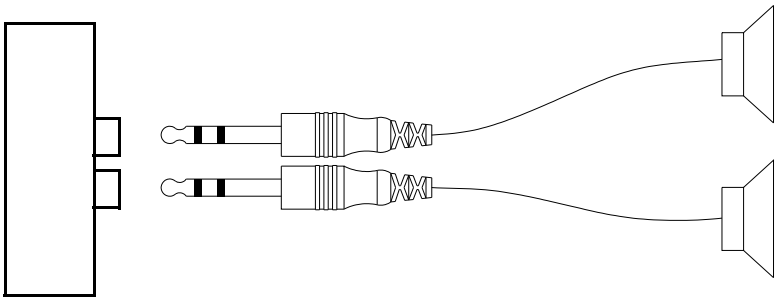


Fig. 20 Free Field without Power Amplifier

With Power Amplifier

- Plug the Power Amplifier cables into the two center sockets in the back panel of Itera II.

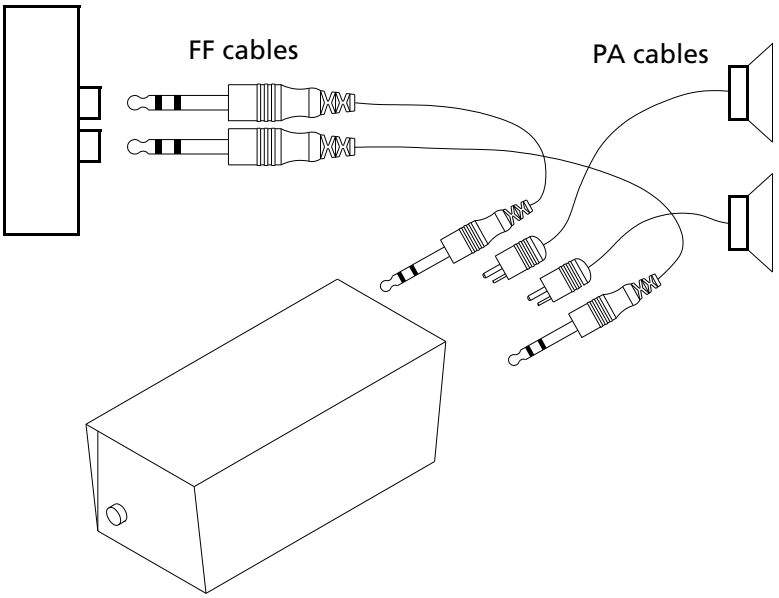


Fig. 21 Free Field with Power Amplifier

13.2.6 Powering

1. Plug the power cord into the power socket on the back of the instrument.
2. Plug the other end of the power cord directly into an AC power outlet with a three-wire protective ground.

13.2.7 Connecting to a PC

See RS 232 INTERFACE ▶ 33 for a description of how to connect the RS 232 cable to Itera II.

If required, use a USB converter for your RS232 cable. See your accessories list to order.

13.2.8 Firmware update - audiometers

If your OTOsuite version contains a more recent firmware for your audiometer, a message will appear when next you switch on your device.

It is recommended that you update your audiometer firmware to make sure that your audiometer and OTOsuite perform correctly.

Follow the on-screen instructions.

App. 1 Maximum Non-Destructive Voltage - MADSEN Itera II

App. 1.1 Input and output sockets

Maximum non-destructive input voltages for input and output sockets relative to earth connection when the instrument is switched on.

SP left and right socket	10 V AC	±10 V DC
AC left and right socket	10 V AC	±10 V DC
BC socket	10 V AC	±10 V DC
CD/TAPE left and right socket	12 V AC	±12 V DC
Speech Talk Over socket	12 V AC	±12 V DC
Monitor socket	12 V AC	±12 V DC
Patient Mic/Talk Back socket	12 V AC	±12 V DC
Digital Aux (For future use.)	5 V AC	±5 V DC
Patient Response socket	12 V AC	±12 V DC
DC Power out	30 V AC	±30 V DC
AC mains inlet	1500 V AC	±370 V DC

App. 1.2 RS232 interface sockets

pin 1 (nc)	240 V AC	± 240 V DC
pin 2 (RxDout)	15 V AC	*± 15 V DC
pin 3 (TxDin)	30 V AC	*± 30 V DC
pin 4 (DTR)	30 V AC	*± 30 V DC
pin 5 (ISO Gnd.)	30 V AC	± 30 V DC

pin 6 (DSR)	30 V AC	*± 30 V DC
pin 7 (RTSin)	30 V AC	*± 30 V DC
pin 8 (CTSout)	15 V AC	*± 15 V DC
pin 9 (nc)	240 V AC	± 240 V DC

Relative to pin 5 on the RS232 interface socket.

For information on how to use MADSEN Itera II with a PC, consult your local supplier.

App. 2 MADSEN Itera II Abbreviations

ABLB	alternate binaural loudness balance
AC	air conduction
AC	alternating current
AM	amplitude modulation
AUTO	automatic
BC	bone conduction
CD	CD (compact disc) player
CH	change
DC	direct current
DEF	default
EXT	external
EXT. R.	extended range
EXTERN	external
FIX	fixed talk over level
FM	frequency modulation
FREQ	frequency
HIS	Hearing Instrument Simulation
HISF	Hearing Instrument Simulation Filter
HL	hearing level

HP	high pass
INT	internal
INT	interrupter
L	left
LCD	liquid crystal display
LED	light emitting diode
LEV	level
LP	low pass
MANU	manual
MASK	masking
MCL	Most Comfortable Level
MIC	microphone
MICL	left external microphone
MICR	right external microphone
MILI	left internal microphone
MIRI	right internal microphone
MOD	modulation
NBN	narrow band noise
o	right ear
P	parameters
PC	personal computer
PCT	percent
R	right

SF	sound field
SIG	signal
SISI	short increment sensitivity index
SP	special output (same as SF)
SPL	sound pressure level
SPN	speech noise
STEN	Stenger
THR	threshold
TON	tone
TRA	transducer
TRANSD	transducer
UCL	UnComfortable Level
VU	volume unit
WARB	warble
WBN	wide band noise (white noise)
WRB	warble
x	left ear

App. 3 Technical Specifications - MADSEN Itera II

App. 3.1 Accessories[1]

TDH39/TC89E headphones
B-71 bone conductor
Patient Response switch
Mains cable
Audiogram pad
This User Manual
HDA 200 headphones for high-frequency audiometry
Insert phones (E-A-RTONE® 3A)
Monitor headphones with microphone
Gooseneck microphones (one right and one left Microphone) for speech audiometry and Hearing Instrument Simulation
Free-field loudspeaker
Power supply cable from the MADSEN Itera II to CD player
PA 210 power amplifier for free-field testing

App. 3.2 Technical Specifications

Channels

2 separate and identical channels

Pure tone frequencies

AC and SF:	12 standard 125 - 8000 and 12500 Hz
BC:	250 - 8000 Hz standard frequencies
Insert phones	125 - 6000 Hz standard frequencies
Accuracy:	Better than 1 %.

[1] Which accessories are standard and which are optional varies from country to country - please consult your local supplier.

Modulation

FM (Warble):	1 - 20 Hz in 1 Hz steps. Mod. width 1% - 25% in 1% steps
AM for SISI:	5, 4, 3, 1, 0.75, 0.50, 0.25 dB HL steps

Attenuator
1 dB HL / 2.5 dB HL / 5 dB HL step resolution over the entire range

Attenuator accuracy

In whole range:	better than 3 dB HL

Between two consecutive attenuator positions:

5 dB HL step:	better than 1 dB HL
2.5 dB HL step:	better than 0.75 dB HL
1 dB HL step:	better than 0.3 dB HL

HL Range
Maximum output will be limited by the transducer.

AC:	-10 to 120 dB HL at mid-frequencies
BC:	-10 to 70 dB HL at mid-frequencies

HIS function

Low pass frequencies:	250 Hz, 500 Hz, 1 kHz or 2 kHz
High pass frequencies:	1 kHz, 2 kHz, 3 kHz or 4 kHz
Amplification options:	0, 5, 10, 15, 20, 25 dB SPL
Max. output:	130 dB SPL (for TDH39)
Max. gain:	50 dB SPL

Masking
Narrow band noise, Speech noise and White noise (Wide band noise)

Total harmonic distortion

Air < 2.5 %

Bone < 5 %

Selectable transducers

AC:	TDH39, HDA200, and E-A-RTONE® 3A
BC:	B71 (Mastoid / Forehead)
SF:	TDH39, HDA200, E-A-RTONE® 3A, Free-Field amplifier/loudspeaker

Transducer options depend on how the MADSEN Itera II is calibrated.

Outputs

AC:	2 x mono jack, 1/4 "
BC:	1 x mono jack, 1/4 "
SF:	2 x mono jack, 1/4 "

External inputs

CD/Tape:	0.2 to 2.0 Vrms, 10 k 2 x RCA phone
Microphone:	0.002 to 0.02 Vrms, 2 x 8-pole DIN
Talk Back:	0.002 to 0.02 Vrms, 5-pole DIN for all microphones

DC bias for electric Mic.

Optional input resistance between: 10 k and 600Ω

Interrupter

Normal:	The signal is presented when the INT button is pressed.
Reverse:	The signal ceases when the INT button is pressed.
Pulse:	The signal is pulses
	The pulse frequency can be adjusted in the range 0.25 to 2.5 Hz in 0.25 Hz steps.
Impulse:	The signal is presented for a preset period of time: 0.25 to 2.5 sec., in steps of 0.25 sec.

Operator output
Two stereo monitor sockets (8-pole DIN horseshoe) for headphones. One socket is fitted with a Talk Over Mic. Input option. The monitor signal follows the test signal, although the volume can be adjusted individually for each channel.

The Talk Back signal from patient to operator is mixed with the monitor signal.

Static force of transducer headbands

TDH 39:	4.5 N ± 0.5 N
B-71:	5.4 N ± 0.5 N

RS232 interface

Format:	8 data bit, 1 stop bit
Parity:	Equal
Baud rate:	9600, 19200, 38400, 57600 Baud
Protocol:	XON/XOFF

Transport and storage

Temperature:	-40 C to + 70 C
Air humidity:	10% to 90%, non-condensing
Air pressure	500 hPa to 1060 hPa

Operating environment

Mode of operation:	Continuous
Temperature:	+10°C to +35°C
Air humidity:	30% to 90%, non-condensing
Air pressure	860 hPa to 1060 hPa.

(Operation in temperatures exceeding -20°C or +60°C may cause permanent damage.)

Warm-up time < 10 min.

Disposal

MADSEN Itera II can be disposed of as normal electronic waste, according to local regulations.

Dimensions	Approx. 450 x 290 x 85 mm, 17.7 x 11.4 x 3.3 inches
Weight	Approx. 4.5 kg, 9.9 lb.
Power supply	Internal, 100 - 240 VAC, 50/60 Hz
Power consumption	< 60 VA
Fuses	T1AL/250V

Standards

Audiometer:	EN60645-1, EN60645-2, EN60645-4, and ANSI S3.6
Patient Safety:	Complies with EN 60601-1, Class 1, Type B; U2601-1;
	CAN/CSA-C22.2 NO 601.1-90.
EMC:	EN 60601-1-2

Miscellaneous

Internal power supply to CD player: 1.5 - 10 V, 0.5 V steps
Software adjustable contrast/brightness on display and LED's.
Integral Talk Over microphone.
Digital Aux: 5-pole DIN

App. 4 Standards and safety - MADSEN Itera II and the Audiometry Module

App. 4.1 MADSEN Itera II

App. 4.1.1 Symbols used

	MADSEN Itera II is marked with this symbol to indicate compliance with Type B requirements of EN60601-1.
	The MADSEN Itera II audiometer and this manual are CE-marked according to the Medical Devices Directive 93/42/EEC.
	**Warning** · *MADSEN Itera II is marked with this symbol when it is important that the user refers to associated warnings given in this manual. Please pay special attention to these warnings.*
	Classified with respect to electrical shock, fire, mechanical and other specified hazards only in accordance with UL2601-1 and CAN/CSA-C22.2 NO 601.1-90
	The power supply to the device has been interrupted.
	The instrument is marked with this symbol to indicate that it is electronic equipment covered by the Directive 2002/96/EC on waste electrical and electronic equipment (WEEE).

App. 4.1.2 Warning notes

- Do not use the instrument in the presence of flammable anaesthetics (gases).
- No parts may be eaten, burnt, or in any other way used for purposes other than audiometry or the fitting of hearing instruments.
- The instrument and any device to be connected which has its own power supply should be turned off before any connections are established.

- It is recommended that an annual calibration be performed on headphones and bone conductor (see Ch. 9). Furthermore, it is recommended that calibration be performed if the equipment has suffered any potential damage (e.g. headphone dropped on the floor). Note that calibration has been performed only on the transducers supplied! If you wish to use any other transducer for testing with MADSEN Itera II, please contact your local distributor first.
- For safety reasons, accessories connected to the equipment's outlet fittings must be identical to the type supplied with the system.
- This class of equipment is allowed in domestic establishments when used under the jurisdiction of a health care professional.
- Unwanted noise may occur if MADSEN Itera II is exposed to a strong radio field, and such noise may interfere in the process of recording a correct audiogram. Many types of electrical devices, e.g. mobile telephones, may generate radio fields. We recommend that the use of such devices in the vicinity of MADSEN Itera II is restricted as much as possible.

The bone conductor cable and insert phone (E-A-RTONE® 3A) cable are not to be removed or tampered with while connected to MADSEN Itera II. Either disconnect the bone conductor entirely from the instrument, or ensure that the instrument itself is disconnected from the mains.

When assembling an electro-medical system, the person carrying out the assembly must take into account that other connected equipment which does not live up to the same safety requirements as this product may lead to a reduction in the overall safety level of the system.

When selecting accessories connected to the RS232 socket and DC output, the following points must be considered:

- Use of connected equipment in a patient environment
- Proof that connected equipment has been tested in accordance with EN60601-1 and/or EN60601-1-1 and UL2601-1 and CAN/CSA-C22.2 NO 601.1-90

Caution · *Grounding continuity should be checked periodically.*

Avoid using extension cables. The increased length of the cable may increase the resistance of the protective earth conductor beyond an acceptable level.

Caution · *Operating at the wrong voltage may blow the fuses!*

For continued protection against fire hazard, replace fuses with the same type and rating only.

App. 4.2 The OTOsuite Audiometry Module

CE
XXXX

The Audiometry Module and this documentation are CE-marked according to the Medical Devices Directive 93/42/EEC.

Used in error messages if program fails. See the detailed information in the dialog box.

App. 4.2.1 Manufacturer

GN Otometrics A/S
2 Dybendalsvaenget, DK-2630 Taastrup, Denmark
T: +45 45 75 55 55, **F**: +45 45 75 55 59
www.otometrics.com

App. 4.2.2 Responsibility of the manufacturer

The manufacturer is to be considered responsible for the effects on safety, reliability, and performance of the equipment ONLY IF:

- All assembly operations, extensions, re-adjustments, modifications or repairs are carried out by personnel authorised by the manufacturer.
- The electrical installation to which the equipment is connected is earthed and complies with IEC requirements.
- And the equipment is used in accordance with the instructions for use.

The manufacturer reserves the right to disclaim all responsibility for the operating safety, reliability and performance of equipment serviced or repaired by other parties.

Index

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

abbreviations 135
ABLB 86
AC connection 32
AC key 21
AC masking
  select transducer 103
AC transducer
  select headphones 102
accessories
  connections 31
  specifications 139
Aided Speech test
  the Aided Speech screen 51
Air conduction
  testing 65
  with masking 69
air conductor 21
  AC connection 32
alternating frequency
  Fowler 30
amplitude 30
annual calibration 124
attenuator
  specifications 140
  steps 29
Audiogram
  combined, enabling/disabling 38
  show combined view, Audiogram Module 38
  show split view, Audiogram Module 38
  viewing frequency range 38
  viewing left-right 38
  viewing legend box 38
  viewing right-left 38
  work area in screen 48
  work area in screen, Audiogram Module 45
Audiogram symbols, Audiogram module 48·50
Audiogram symbols, Itera II 18
Audiometry
  basic functions 35
  menu bar 36
  OTOsuite toolbar 36
  user interface 35
Audiometry module
  main window 35

B

baud
  rate setting 111
BC connection 32
BC key 21
BC masking
  select transducer 103
BC transducer
  select bone conductors 102
beep
  function 20
  ON/OFF, setting 110
binaural speech test
  input selection 79
  input sensitivity 79
  masking 81
  masking level 82
  mixing input signals 80
Bone conduction
  testing 67
bone conduction
  BC transducer 102
bone conductor 21
  BC connection 32
  calibration 124
butterfly 105

C

Cables
  connecting test equipment 59
calibration 124
  annual 124
  certificate 125
CD
  power supply voltage, setting 111
  selection 23
CD key 23
CD/tape
  connection 32
  power supply 33
  select input sensitivity 109
cleaning 123
  accessories 124
  device 123

Combined audiogram
enabling/disabling 38
Configuration Wizard 115
connections
AC 32
accessories 31
BC 32
CD/TAPE 32
DC POWER OUT 33
EXTERNAL MIC./MONITOR HEADSET 32
headphone 32
MONITOR 32
PATIENT RESPONSE 33
RS232 33
SP (SF) 32
supply voltage 33
TALK BACK 32
Control Panel
Audiometry description 39
controls 19
counter
start or stop 25
Curves and symbols 52
selecting 39

D

data
transmission 24
data transmission 24
dB
level for new frequency 106
level for new transducer 106
space setting 111
dB STEP key 29
DC POWER OUT connection 33
DC POWER OUT voltage 30
default settings 112
default test parameters 102
delete
measuring points 23
thresholds 23
Device - software interfacing 11
display 17
setup 111

E

ear selection 27
ERASE key 23
EXT. RANGE key 26
extended range
dB-space, setting 111
on or off 26
timeout, setting 111
EXTERNAL MIC./MONITOR HEADSET connection 32

F

Fetch test results from audiometer 39
filter
HIS 93
Firmware update, test devices (Aud.) 131
Fowler 86
alternating tone frequency setup 27
storing results 87
frequency
butterfly 105
change test f. 26
change with STORE 104
changing 29
dB level for new f. 106
pulse 108
select automatic 109
select manual 109
specifications 139
warble 109
wrap 104
FREQUENCY key 29
Frequency range, audiogram
viewing 38
front panel 19
display 17
functions
AC 21
BC 21
beep 20
CD 23
dB STEP 29
ERASE 23
EXT. RANGE 26
FREQUENCY 29

IMPULSE 22
input signal 23
INT, left 31
INT, right 31
LEVEL, left 30
LEVEL, right 30
LR 27
MASK 28
MASK LOCK 28
MASK OFF 28
MASK ON 28
MIC 23
MIC. 24
PULSE 22
RESPONSE 23•25
REVERSE 23
SETUP 27
SF 21
SIGNAL 22
SPECIAL 21
SPEECH 21
START/STOP 25
STORE 26
TALK BACK 28
TALK OVER 24
TONE 21
TRANSD. 21
WARBLE 22
XMIT 24
fuses
fuse types 124
replacement 124

G

gooseneck microphones
connection 32

H

headphones
calibration 124
Hearing Instrument Simulation 88
Hearing Instrument Simulator
filter 93
master volume regulation 92
reference level 91
specifications 140
value selection 30
HIS 88
HL
range specifications 140
selection 109

I

Icons
combined view, Audiogram Module 38
split view, Audiogram Module 38
impulse
length 108
time 30
IMPULSE key 22
input sensitivity 30
binaural 79
CD/tape 109
microphone 109
monaural 77
input signals
binaural 80
CD 23
microphone 23
REVERSE 23
selection 23
installation
connections 31
location 127
powering 131
instrument, overview 17
INT, left key 31
INT, right key 31
intended use 11
interface cable
connection 33
Interfacing
OTOsuite modules, audiological test equipment 11
internal microphone 24
interrupter
specifications 141

interrupting speech signal 78

K

keys 19
AC 21
BC 21
CD 23
dB STEP 29
ERASE 23
EXT. RANGE 26
FREQUENCY 29
IMPULSE 22
input signal 23
INT, left 31
INT, right 31
LEVEL, left 30
LEVEL, right 30
LR 27
MASK 28
MASK LOCK 28
MASK OFF 28
MASK ON 28
MIC 23
PULSE 22
RESPONSE 23•25
REVERSE 23
SETUP 27
SF 21
SIGNAL 22
SPECIAL 21
SPEECH 21
START/STOP 25
STORE 26
TALK BACK 28
TALK OVER 24
TONE 21
TRANSD. 21
WARBLE 22
XMIT 24

L

LEDs
light, setting 110
Left - Right audiogram
viewing 38
Legend
Audiometry 48•50
Speech Mapping 50
Legend box, audiogram
viewing 38
LEVEL, left key 30
LEVEL, right key 30
location of instrument 127
LR key 27

M

Main window
Audiometry module 35
maintenance 123
replacing fuses 124
manufacturer 147
MASK key 28
MASK LOCK key 28
MASK OFF key 28
MASK ON key 28
Masking
air conduction 69
masking
binaural 81
level, binaural 82
monaural 77
on/off, lock 28
select AC transducer 103
select BC transducer 103
select presentation 103
select SF transducer 103
select stimulus for speech test 104
select stimulus for tone test 104
selecting m. transducer 29
signal 31
SISI 85
with monaural/binaural test signals 96
Masking Assistant 54
Masking assistant
enabling/disabling 37
master volume regulation
HIS 92
MCL, Itera II 83
measuring points
deleting 23

Menu bar
Audiometry 36
microphone
internal 24
select input sensitivity 109
selection 23
talk back connection 32
modulation
specifications 140
modulation size
warble 108
monaural speech test 75
input selection 75
input sensitivity 77
masking 77
speech in noise 80
word count 78
monitor
left, setting 110
ON/OFF setting 110
right, setting 110
MONITOR connection 32
monitor headset
connection 32
Most Comfortable Level, Itera II 83

N

Navigating in Audiometry 35
No response 26

O

ON/OFF
power switch 34
Overlays
viewing 37
overview, instrument 17

P

parameters
AC masking 103
AC transducer 102
baud rate 111
BC masking 103
BC transducer 102
CD power supply 111
CD/tape input sensitivity 109
changing 27
dB level new frequency 106
dB level new transducer 106
default settings 112
display setup 111
extended range dB-space 111
extended range timeout 111
frequency change with STORE 104
impulse length 108
internal beep 110
item selection 30
light in LEDs 110
masking presentation 103
microphone input sensitivity 109
monitor left 110
monitor ON/OFF 110
monitor right 110
pulse frequency 108
save test setup 102
select automatic frequency 109
select manual frequency 109
set default test parameters 102
setup 99
SF masking 103
SF transducer 103
shortcut 99
signal unit 109
speech count 104
speech masking signal 104
stimuli knob 112
talk back microphone sensitivity 110
talk over 110
tone masking signal 104
warble frequency 109
warble modulation size 108
patient communication
talk over 24
patient response
shown on display 23·25
switch connection 33
PATIENT RESPONSE connection 33
pc interface
cable connection 33

power switch 34
powering 131
Preparing for testing
  connecting cables 59
pulse frequency 30
PULSE key 22

R

range,extended 26
receiving the instrument 127
reference level
  HIS 91
replacement
  fuses 124
RESPONSE key 23•25
REVERSE key 23
Right - Left audiogram
  viewing 38
RS232 connection 33

S

safety 145
save test setup 102
Screens
  Aided Speech 51
  Audiometry module main window 35
  Speech 48
  Tone, Audiogram Module 45
sensitivity
  talk back microphone 110
Settings
  Control Panel 39
settings
  default s. 112
setup
  parameters 99
SETUP key 27
SF key 21
SF masking
  select transducer 103
SF transducer
  select headphones/free-field loudspeaker 103
shortcut
  parameters 99
SIGNAL key 22
signal unit
  select 109
SISI 83
  changing number of small increments 27
  masking 85
  signal type selection 30
  storing results 85
Sound field testing 67
SP (SF) connection 32
special Hearing Instrument Simulation (HIS) 88
SPECIAL key 21
special tests 83
  Fowler (ABLB) 86
  SISI 83
  Stenger 87
special transducer 21
specifications 139
  accessories 139
speech in noise 80
SPEECH key 21
Speech test
  the Speech screen 48
speech test
  heard words 31
  masking setup in one ear 27
  mixed signals 27
  select number of words 104
  test signal in both ears 27
  unheard words 31
speech testing 75
  interrupting speech signal 78
  monaural 75
  word count 78
SPL
  selection 109
standards 145
start
  counter, timer 25
START/STOP key 25
Stenger 87
stimuli
  knob setting 112

stimulus
impulse 22
pulse 22
selection 22
warble 22
stop
counter, timer 25
STORE key 26
storing results
Fowler 87
SISI 85
supply voltage
connection 33
symbols 145
Symbols and curves
selecting 39
Symbols, audiogram module 48·50
Symbols, audiogram, in Itera II 18

T

talk back
level 30
microphone sensitivity 110
volume 28
TALK BACK connection 32
TALK BACK key 28
talk over
settings 110
TALK OVER key 24
technical specifications 139
Test devices (Audiometry)
firmware update 131
Test equipment
connecting cables, Audiometry 59
test frequency
change 26
test parameters
changing 27
set default 102
test report 125
test setup
save 102
test signals 31
monaural/binaural and masking 96
test types 21
Testing
air conduction 65
bone conduction 67
testing 65
ABLB 86
Fowler 86
Hearing Instrument Simulation (HIS) 88
monaural speech t. 75
SISI 83
special tests 83
speech t. 75
Stenger 87
Tests
Aided Speech screen 51
controlling from Control Panel 39
Speech screen 48
Tone screen, Audiogram Module 45
thresholds
deleting 23
store 26
timer
start or stop 25
TONE key 21
Tone test
the Tone screen, Audiogram Module 45
Toolbar
Audiometry 36
Tools menu (Aud)
Curves and symbols 39
fetch test results from audiometer 39
TRANSD. key 21
transducers
AC 21
AC connection 32
AC, headphones 102
BC 21·102
calibration 125
dB level for new t. 106
selection 21
SF 21·103
SF connection 32
specifications 141
transmission
data 24

U

UCL, Itera II 83
UnComfortable Level, Itera II 83
User interface 35

V

value selection
    HIS 30
View menu (Aud)
    audiogram legend 38
    combined audiogram 38
    frequency range 38
    left-right audiogram 38
    masking assistant 37
    Overlays 37
    right-left audiogram 38
voltage
    maximum non-destructive 133

W

warble
    frequency 109
    modulation size 108
    selection 30
    setup selection 30
WARBLE key 22
warning notes 145
word count 30•78
    failed word 31
    heard word 31
    select method 104
wrap 104

X

XMIT key 24

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z