

MADSEN Itera II Reference Manual

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Technical support

Please contact your supplier.

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1 Introduction to MADSEN Itera II



MADSEN Itera II is an audiometer for testing a person's hearing.

With MADSEN Itera II you can perform all standard audiometric tests, tone and speech audiometry and special tests.

Depending on the configuration, various special tests such as SISI, Stenger, ABLB (Fowler), and HIS are available.

- MADSEN Itera II can be used in connection with the OTOsuite Audiometry Module software for online monitoring of test results, data export and storage, printing, and NOAH compatibility.
- MADSEN Itera II can be used as a portable instrument or as a desktop unit (fixed installation).

Operation

The front panel buttons have indicator lights, which clearly show the device's current settings.

Sound level, frequency and other information are shown clearly on the device 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".

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 [SETUP items ▶ 87](#)).

MADSEN 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 [Managing Data and Results ▶ 83](#)).

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

1.1 The Audiometry Module



OTOSuite

OTOSuite is a software tool that integrates a suite of audiological tests with result review and reporting capabilities into a single powerful PC application.

The OTOsuite Audiometry Module is designed to operate with MADSEN Itera II as the test device.

The OTOsuite Audiometry Module

The OTOsuite Audiometry Module provides you with comprehensive control and overview of the current stimulus and masking choices both numerically and graphically in the displayed audiogram when you test with a connected Otometrics audiometer.

As the module is part of OTOSuite, audiograms can be used directly in other OTOSuite modules such as the PMM and Immittance modules for an optimized workflow independent of NOAH, and for combined reporting.

The OTOSuite Audiometry Module supports

- basic tone audiometry and
- speech testing
- a range of special tests.

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.

1.2 Intended use

MADSEN Itera II and the Audiometry module

Users: audiologists, ENTs and other health care professionals in testing the hearing of their patients.

Use: diagnostic and clinical audiometric testing.

1.3 About this manual

This is your guide to installing, calibrating and using MADSEN Itera II and to using the OTOSuite Audiometry Module. It also introduces you to the key features of the device and the software, as well as to working scenarios for performing tests and viewing and printing test results.

We strongly recommend that you read this manual carefully before using MADSEN Itera II and the Audiometry Module for the first time.

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

Training

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

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 MADSEN Itera II with OTOSuite, you can configure OTOSuite to use another term.

1.3.1 Safety

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

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

Safety information is stated where it is relevant, and general safety aspects are described in [Standards and safety ▶ 113](#).

- [Standards and safety ▶ 113](#) gives you an overview of device labelling and standards.
- [Warning notes ▶ 114](#) contains relevant warning notes.

1.4 Typographical conventions

The use of Warning, Caution and Note

To draw your attention to information regarding safe and appropriate use of the device or software, the manual uses precautionary statements as follows:

Warning • *Indicates that there is a risk of death or serious injury to the user or patient.*

Caution • *Indicates that there is a risk of injury to the user or patient or risk of damage to data or the device.*

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

1.4.1 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

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

Training

We recommend that you read this manual and make yourself familiar with the MADSEN Itera II, and how it operates with the OTOsuite Audiometry Module.

Safety

For safety information, see

- [Standards and safety ▶ 113](#)

Installation

- To install the new system, see [Unpacking and installing ▶ 103](#)
- If you are using OTOsuite, install OTOsuite from the OTOsuite Installation disk. See the OTOsuiteInstallation Manual.

Connecting to MADSEN Itera II

[Socket connections - rear panel ▶ 26](#) shows the location of the sockets for the various accessories required.

- To connect the accessories, see [Installation ▶ 103](#):
 - 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.

Configuring the OTOsuite Audiometry Module

- See see [Configuring the Audiometry Module ▶ 99](#).

Preparing for testing

Before you receive the client and start the session of testing and explaining test results, your time is well spent preparing for the session.

- Test preparations are described in [Preparing for testing ▶ 51](#)
- Customization of the test equipment is described in [Customizing your setup ▶ 12](#)

Descriptions and testing

In order for you to feel well prepared and confident before you receive clients for testing using the Audiometry Module, see the test screen descriptions. They provide you with examples on how to view the test results.

- The basic OTOsuite functions are described in the OTOsuiteUser Guide.
- The test screens are described in [Navigating in the OTOsuiteAudiometry Module ▶ 29](#).

Printing

- See the OTOsuiteUser Guide.

2.3 Customizing your setup

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

Changing the 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.

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 [Temporary changes in the setup ► 86](#).

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



A. Rear panel connections

The rear panel contains the sockets for connecting various accessories and the socket for power connection. See [Socket connections - rear panel](#) ▶ 26.

B. On/Off switch

The side panel contains the On/Off switch. See [Side panel](#) ▶ 28.

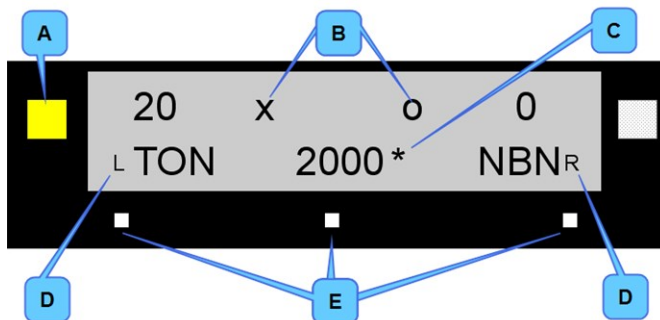
C. Display

Settings and the test as it progresses are shown on the display. See [Display](#) ▶ 13.

D. Front panel controls

MADSEN Itera II is operated from the front panel. See [Front panel controls](#) ▶ 15.

3.1 Display



- A. Test signal indicator
- B. Audiogram symbols
- C. Stored threshold
- D. Ear indicator
- E. Function key markers

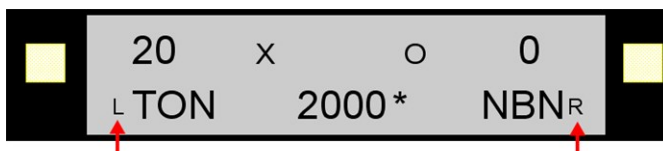
During start-up the display briefly shows information regarding the device type and version, followed by the test screen last used.

The abbreviations used on the display are explained in [Abbreviations](#) ▶ 111.

Top line

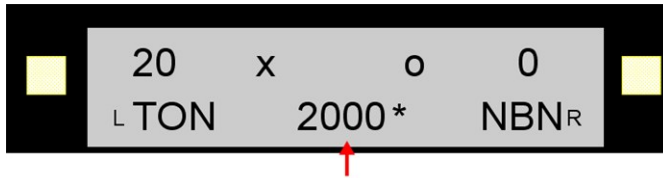
- During Tone testing the upper line in the display shows the intensity numerically in dB HL for the left and right ear.
- During Speech testing and HIS the upper line is transformed into one or two VU meters.

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 [SETUP items ▶ 87](#).

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

Left ear Response/No response		Right ear Response/No response		
×	×↘	○	○↘	Air, unmasked
□	□↘	△	△↘	Air, masked
>	>↘	<	<↘	Bone, mastoid, unmasked
⌋	⌋↘	⌊	⌊↘	Bone, mastoid, masked
§	§↘	§	§↘	Sound field, unmasked (binaural - applies to both ears)
⦿	⦿↘	⦿	⦿↘	Sound field, masked
U		U		UCL (UnComfortable Loudness level)
M		M		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 front panel.

The button light indicators

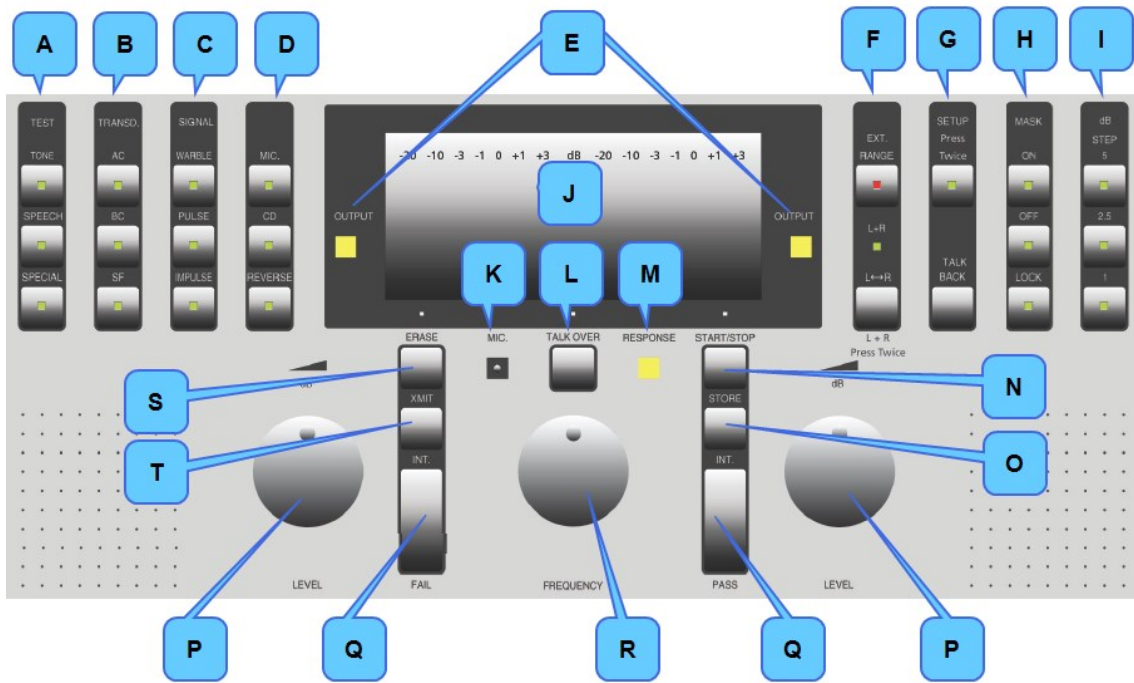
Each button has its own function. Some buttons have a light to indicate whether the function is currently active or not.

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

3.2.1 Front panel layout

The MADSEN Itera II buttons and controls are grouped according to their function and how frequently they are used.

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



- | | | |
|---|---------------------------------------|--|
| A. Test column ▶ 16 | H. Masking ▶ 20 | P. Stimulus/masking intensity knobs ▶ 23 |
| B. Transducer column ▶ 17 | I. dB steps ▶ 21 | Q. Stimulus/speech count buttons ▶ 24 |
| C. Signal column ▶ 18 | J. Display ▶ 13 | R. Frequency ▶ 25 |
| D. Input - MIC, CD, REVERSE ▶ 18 | K. Microphone ▶ 21 | S. Erase ▶ 25 |
| E. Signal indicators ▶ 19 | L. Talk over ▶ 22 | T. Xmit ▶ 26 |
| F. Extended range ▶ 19
Change Ear (L ↔ R) ▶ 20 | M. Response indicator ▶ 22 | |
| G. Setup ▶ 20
Talk back ▶ 20 | N. Start/Pause/Stop ▶ 22 | |
| | O. Store/toggle threshold status ▶ 23 | |

Beep

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

3.2.2 Test column

Press to select the test:



- **TONE**
Selects the Tone Threshold test.
- **SPEECH**
Selects the Speech test.
- **SPECIAL**
Press to see the optional test types. Press the desired 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

- [MCL tone testing ▶ 73](#)
- [UCL tone testing ▶ 73](#)
- [SISI \(Short Increment Sensitivity Index\) ▶ 73](#)
- [ABLB \(Alternate Binaural Loudness Balance\) ▶ 75](#)
- [STENGER Test ▶ 76](#)
- [Hearing Instrument Simulation \(HIS\) ▶ 77](#)

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 Transducer column

Press to select the output transducer:



- **AC**
Selects the Air Conductor
- **BC**
Selects the Bone Conductor
- **SF**
Selects 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**, [SETUP items ▶ 87](#), [SETUP items ▶ 87](#) and [SETUP items ▶ 87](#), the relevant transducer cannot be selected.

3.2.4 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 Input - MIC, CD, REVERSE



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 goose neck 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**, [SETUP items ▶ 87](#).

The permitted signal source depends on the **TEST** selected, see [Display ▶ 13](#).

Speech and HIS

- Press **REVERSE** to toggle the signal.

3.2.6 Signal indicators**Output**

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

3.2.7 Extended range

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**, [SETUP items ▶ 87](#)):

- **Auto**
All levels at all frequencies are always accessible, but the Extended Range button is lit when a level above the safety limit is reached.
- **Manual**
You must manually press the Extended 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**, [SETUP items ▶ 87](#),
- the duration set for Ext. Range Timeout is exceeded and the device has been inactive (**SETUP**, [SETUP items ▶ 87](#)),
- you select a new test, or

- you change FREQUENCY, see [Frequency ▶ 25](#).

3.2.8 Change Ear (L <--> R)



- 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.

3.2.9 Setup

Changing the setup temporarily

To change the setup temporarily, use the *Shortcut* function ([Temporary changes in the setup ▶ 86](#)). These changes will not be saved when you switch off the device.

Changing the setup permanently

To change the setup permanently, press the **SETUP** button to access the various parameters. See [Permanent changes in the setup ▶ 85](#).



1. Press **SETUP twice** to change default settings, see [Setup of parameters ▶ 85](#). This 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.

3.2.10 Talk back



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, SETUP items ▶ 87**), 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, SETUP items ▶ 87**).

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

3.2.11 Masking

- By default, you always adjust the stimulus signal level on the **Left Level** knob, regardless of whether you are testing the right or left ear.

- To adjust the masking intensity use the **Right Level** knob.
To change the default setting, select **SETUP, SETUP items ▶ 87**.

**OFF**

No masking

ONTo adjust the masking intensity independently of the signal level use the **Right level** knob.**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** knob.**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, and (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.

3.2.12**dB steps**

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, SETUP items ▶ 87**) instead of HL.

3.2.13**Microphone**

The internal microphone for Talk Over and Speech testing.

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

3.2.14 Talk over



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 [SETUP items ▶ 87](#)), 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 [3.3 ▶ 26](#)).

3.2.15 Response indicator



Lights up when the patient presses the patient responder. You will hear a "beep" at the same time.

See [The patient responder ▶ 52](#).

3.2.16 Start/Pause/Stop



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

SISI

- Press to **Start/Pause** and **Stop**.

HIS

- Press to activate the filters.

3.2.17 Store/toggle threshold status

Note • This button is not applicable in Speech testing.

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



Stores a threshold in the internal memory.

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

Change frequency after STORE

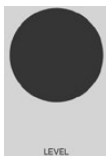
- You can set up the **Store** button to automatically change the stimulus to the next test frequency.

See **SETUP**, [SETUP items](#) ► 87.

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.

3.2.18 Stimulus/masking intensity knobs

Left Level knob



Intensity change

- Changes the intensity for the stimulus signal regardless of whether the signal is being sent to the left or right ear. Turn clockwise to increase the intensity and counter-clockwise to decrease.

To change this setting, select **SETUP**, [SETUP items](#) ► 87.

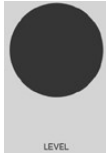
Masking and intensity

If the masking signal is in locked mode, the intensity of the masking signal is also changed.

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	Master volume value selection in HIS.
Parameter selection, SETUP	Parameter selection in SETUP .

Right Level knob



Intensity change

Changes the intensity of the masking signal in the selected dB steps. To change this setting, select **SETUP**, [SETUP items](#) ► 87.

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.
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.

3.2.19 Stimulus/speech count buttons

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 [Signal indicators](#) ► 19).

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

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

- **Speech testing** ([Stimulus/speech count buttons](#) ► 24)
Press this button to count "unheard words" (FAIL).

Right INT button (PASS)

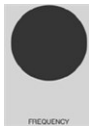


Usually functions in total parallel with the **left INT** button.

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**, [SETUP items ▶ 87](#).

- **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.

3.2.20 Frequency



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**, [SETUP items ▶ 87](#)

FREQUENCY shortcut functions

Display graphs, HIS mode

If you turn this knob in HIS mode, various graphs will be shown (see [Hearing Instrument Simulation \(HIS\) ▶ 77](#)).

3.2.21 Erase

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



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.
To delete all data, press the function key below **YES**.
To cancel the **ERASE** command, press the function key below **NO**.

Additional functions

Speech Audiometry and a number of special tests, various counter values:

- Press to reset to zero.
See the description of [Test column ▶ 16](#), and [Special tests ▶ 73](#)),

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 [SISI \(Short Increment Sensitivity Index\)](#) ▶ 73).

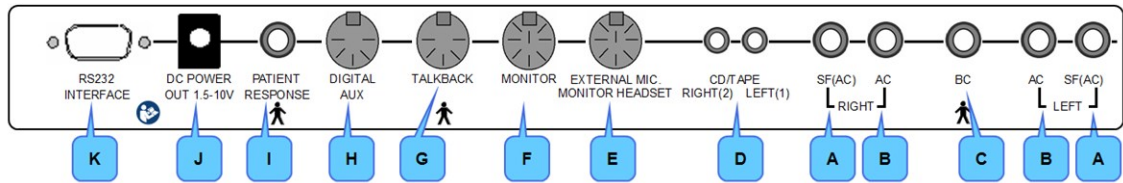
3.2.22 Xmit



This button is not active.


3.3 Socket connections - rear panel



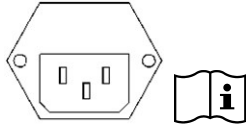
The socket connections on the back of MADSEN Itera II are protected by a guard, which is hinged onto the front panel and held shut by a spring-clip at each end. Open this guard in order to connect or disconnect accessories or cables to the back of MADSEN Itera II.



- A. SF (AC), right and left
- B. AC
- C. BC
- D. CD/Tape
- E. External microphone/Monitor headset
- F. Monitor
- G. Talk back
- H. Digital aux.
- I. Patient response
- J. DC power out
- K. RS232 interface

Socket	Description
A. SF (AC)	Connection for 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).
B. AC	Connection for the AC transducer to the headphone. Blue 1/4" jack plug for left (AC Left) and red 1/4" jack plug for right (AC Right).
C. BC	Connect the black 1/4" jack plug from the bone conductor.

Socket	Description
D. CD/TAPE	<p>Connection of CD or tape recorder - Left (1) and Right (2).</p> <p>Caution • When you connect other electrical equipment to MADSEN Itera II, remember that equipment that does not comply with the same safety standards as MADSEN Itera II can lead to a general reduction in the system's safety level.</p> <p>Note • It is recommended that MADSEN Itera II supplies power to the CD/Tape player.</p>
E. EXTERNAL MIC./MONITOR HEADSET	<p>Connection for the gooseneck microphones for speech audiometry or monitor headset with internal microphone.</p>
F. MONITOR	<p>Connection for the monitor head set without internal microphone. Can be used if a stereo microphone is connected to EXTERNAL MIC./MONITOR HEADSET.</p>
G. TALK BACK	<p>Connection for the Talk Back microphone, for communication from patient to operator. Set the switch on the Talk Back microphone to ON.</p>
H. DIGITAL AUX	<p>N/A.</p>
I. PATIENT RESPONSE	<p>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.</p>
J. DC POWER OUT 	<p>Power supply for the CD/TAPE player. Adjustable from SETUP, SETUP items ▶ 87 (OFF and 1.5 - 10 volt DC, 500 mA). Use the right LEVEL selector to select.</p> <p>Note • Remember to use an adapter if necessary so that the CD has the correct polarity. The center pin is + and the sheath is 0V.</p> <p>Note • It is recommended that MADSEN Itera II supplies power to the CD/Tape player.</p>

Socket	Description
<p>K. RS 232 INTERFACE</p> 	<p>To connect the device to a PC, use the optional 9-pole PC- RS232 interface cable.</p>  <p>The installation must be carried out in accordance with Medical Electrical Systems in IEC 60601-1 3.1 edition: 2012, ANSI/AAMI ES60601-1 (2005) + AMD 1 (2012) and CAN/CSA-C22.2 No. 60601-1 (2014). The supplementary provisions on the reliability of electro-medical systems.</p> <p>It is a general rule for all electrical equipment used in the proximity of the client that:</p> <ul style="list-style-type: none"> • The connected equipment must comply with Medical Electrical Systems in IEC 60601-1 3.1 edition:2012. <p>For information on how to use the device with a PC, see Managing Data and Results ► 83.</p>
	<p>Supply voltage connection</p> <p>100-120 V AC, 200-240 V AC, 50/60 Hz, 60 VA</p> <p>Fuses: 2 T 1 A H/250 V, 5 mm 20 mm.</p> <p>Before you replace a fuse, first switch off the instrument and disconnect it from the mains power supply. See Fuses ► 101.</p>

3.4 Side panel

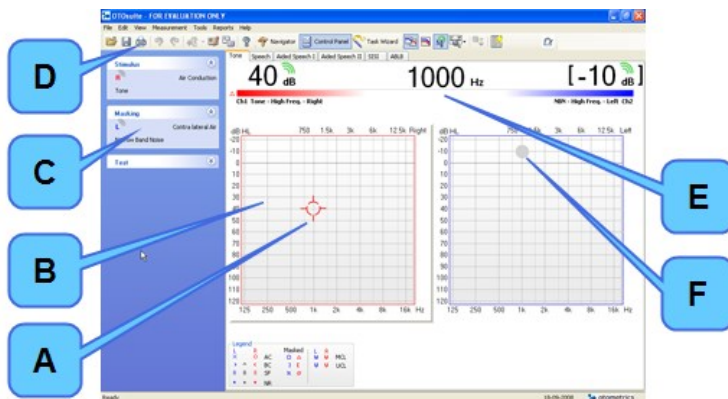
Located on the right side of the device.



Power On/Off

4 Navigating in the OTOSuiteAudiometry Module

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



- | | |
|--------------------|----------------------------|
| A. Stimulus marker | D. Audiometry toolbar |
| B. Work area | E. Stimulus bar |
| C. Control Panel | F. Masking level indicator |

Screen descriptions

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

- [The Tone test screen ► 39](#)
- [The Speech test screen ► 45](#)

4.1 Audiometry Module features

Note • Some of the features below are device-dependent.

With the Audiometry Module, you can

- perform testing while you follow stimulus settings and test progress on your PC display
- view and print test results
- view historic audiometry results from NOAH
- view online audiometry results during 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

4.2 The Audiometry Module menu system and toolbar

General icons

See the OTOSuiteUser Guide.



Audiometry icons and menu selections

The icons and menu selections that are unique to Audiometry functionality depend on the test functions included in OTOSuite and/or whether a test device is connected.

Audiometry icons

Tone audiometry



Speech audiometry



4.2.1 File menu



Menu item	Icon	Description
New Audiogram		Select new audiogram. You will be prompted to save or cancel current data.






4.2.2 Edit menu

Menu item	Shortcut	Description
Audiometric properties...	Ctrl+U	Click to enter Tester name, Test Date, and air conduction transducer for a manually entered audiogram. <i>Note • The air conduction transducer is stored when you have selected it in the transducer section of the Control Panel (or with device controls, if applicable) and data points are entered on the audiogram.</i>

4.2.3 View menu

Menu item	Icon	Description
Masking Assistant		Enable or disable the Masking Assistant. The Masking Assistant causes an unmasked threshold to flash repeatedly if masking is recommended. <ul style="list-style-type: none">See The Masking Assistant ► 33.


Menu item	Icon	Description
Overlays		<p>Enables or disables the overlays. Overlays display</p> <ul style="list-style-type: none"> • pictures • severity • speech banana, • speech letters, • unusable area <p>on the audiogram.</p> <p>Overlays can also be displayed by selecting them from the overlays box below or next to the audiogram.</p> <p>To view/hide the overlays box, select Tools > Options > General.</p>
Combined Audiogram		<p>Click to toggle between viewing both ears in a single audiogram (combined audiogram) or both a left and a right audiogram on your screen.</p>
	 	<p>Combined View</p> <ul style="list-style-type: none"> • Click to view both ears in a single audiogram. <p>Split View</p> <ul style="list-style-type: none"> • Click to view separate audiograms for each ear.
Left - Right		<p>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 Dual Graph View is enabled in Options > Audiometry > Tone > Misc).</p>
Right - Left		<p>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 Dual Graph View is enabled in Options > Audiometry > Tone > Misc).</p>
Audiogram Legend		<p>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.</p>

Menu item	Icon	Description
Standard / All / High frequencies		The graph shows up to 20,000 Hz. MADSEN Itera II presents stimulus up to 12,500 Hz. <ul style="list-style-type: none"> Click to choose between viewing:
		Standard Frequencies Displays the audiogram from 125 to 8000 Hz.
		All Frequencies Displays the audiogram from 125 to 20,000 Hz.
		High Frequencies Displays the audiogram from 8000 to 20,000 Hz.
Select Orientation		Click to select the perspective of the patient's ears as presented on the screen for graph and table views.
Scoring and Playing		See Speech testing ► 67.

4.2.4 Tools menu

Menu item	Description
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 Curves and symbols selection ► 41.
Options...	See description of how to work with user options and User Tests in the OTOSuiteUser Guide.

Additional icons


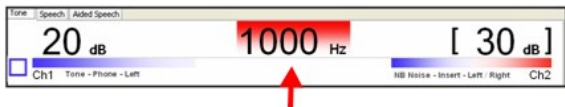


Menu item	Description
Import Audiometry Data 	Click to import audiometry data from AURICAL Plus and MADSEN Conera. See the OTOSuiteUser Guide.

4.3 The Patient Responder indicator

When the patient presses the Patient Responder this is shown on the Stimulus bar, and a sound signal from the PC is heard through the Monitor Speaker or Operator Headset. The sound signal is optional (**Tools > Options > Audiometry >**

General > Measurement, Misc > Audible patient response).

Use the Configuration Wizard to select Single Responder or Dual Responder setup. See [Configuring the Audiometry Module ▶ 99](#).

Single Responder setup	
<ul style="list-style-type: none"> Green Indicates that the patient is pressing the Patient Responder. 	
Dual Responder setup	
<ul style="list-style-type: none"> Red Indicates that the patient is pressing the right response button. 	
<ul style="list-style-type: none"> Blue Indicates that the patient is pressing the left response button. 	
<ul style="list-style-type: none"> Red and blue Indicates that the patient is pressing both response buttons. 	

4.4 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.

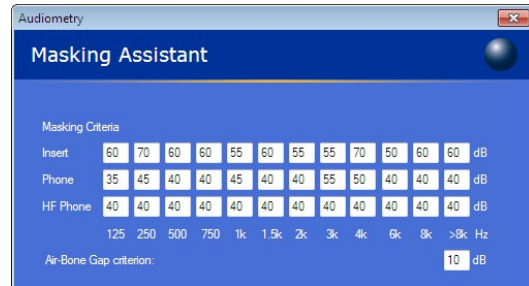
The Masking Assistant is a tool provided to help you with an indication that there may be frequencies where testing with masking¹ is recommended.

- The audiogram symbol will flash at the specific frequencies where contralateral masking may be recommended².

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

²Based 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 masking criteria are configurable so that you can set them up to match your local recommendations for masking. You can for instance choose either frequency specific criteria, which increases the efficacy of your work, or the traditional "one-level-fits-all" criteria. Select the **Tools > Configuration Wizard > Audiometry - Configure... > Masking Assistant** to set up the masking criteria.



All masking signals are calibrated in effective masking.

How does the Masking Assistant work?

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		$AC > ACc + \text{Min IA}$
	or	$AC > BCc + \text{Min IA}$
BC		$BC < AC - x^* \text{ dB}$

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.

* denotes configurable Air/Bone gap criterion (**Tools > Configuration Wizard > Audiometry - Configure... > Masking Assistant**).

Min IA is frequency specific

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

¹Katz, 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.

Min IA (supraaural phone: TDH-39), frequency specific

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

Hz	dB	
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)

4.5 The Audiometry Module Control Panel



Click the **Control Panel** icon in the toolbar to activate the 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 OTOSuiteUser Guide.

The Audiometry Module Control Panel shows the settings selected on the connected audiometer for the specific test.

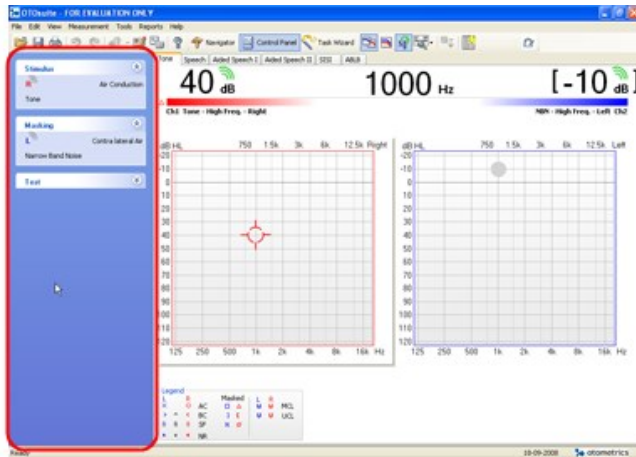


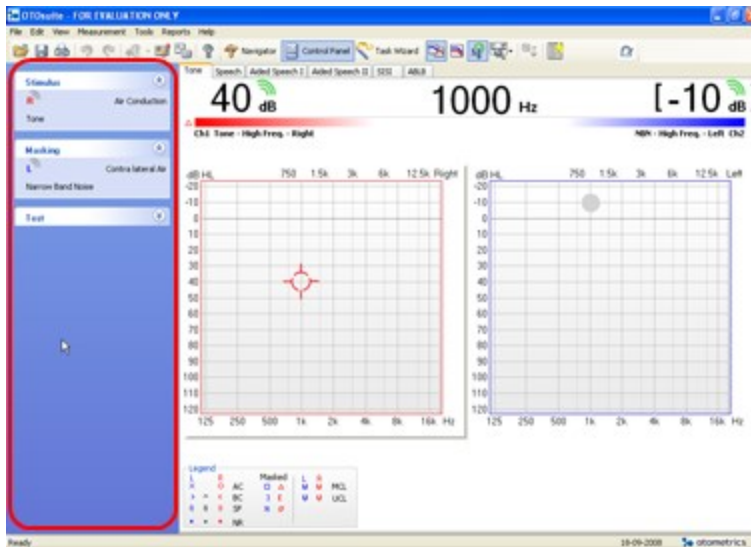
Fig. 1 The MADSEN Itera II Control Panel

4.5.1 The Control Panel

When you activate the OTOSuite Audiometry Control Panel, MADSEN Itera II automatically connects to the audiometer.

Note • You cannot operate MADSEN Itera II from the Control Panel.

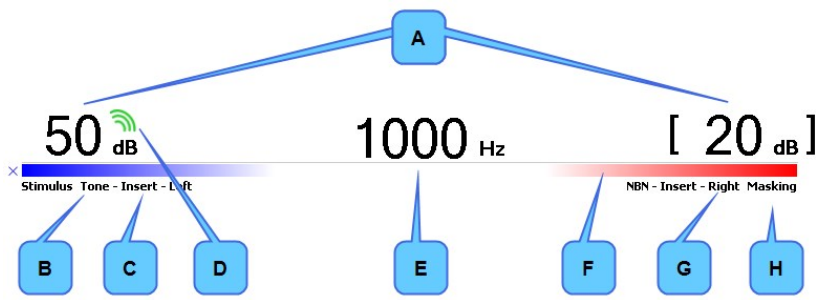
The Control Panel is divided into a number of sections where you can view various settings, and a section for controlling communication with the audiometer.



Stimulus	The Stimulus panel shows the stimulus type used and the selected test ear.
-----------------	--

Masking	The Masking panel shows the masking used and the selected test ear.
Test	The Test panel shows the test type used.
Connection	<p><i>Note • If there is a risk that patient selected in the audiometer does not correspond with the patient shown in OTOsuite or NOAH status bar, a warning triangle will be shown on the screen.</i></p> <ul style="list-style-type: none"> • Make sure that you select the correct patient, either in the audiometer or in OTOsuite.

4.6 The stimulus bar



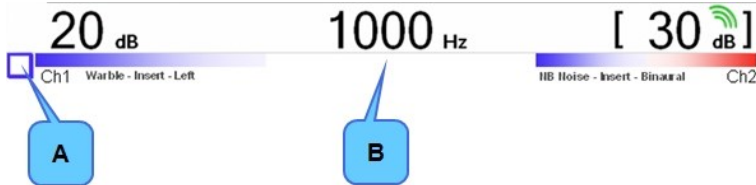
- | | |
|-----------------------------|-----------------------|
| A. Intensity | E. Frequency |
| B. Stimulus indicator | F. Stimulus bar color |
| C. Transducer indicator | G. Routing indicator |
| D. Stimulus being presented | H. Masking on |

Intensity
Indicated by the dB level above the channel status bars.
<ul style="list-style-type: none"> • 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:
<ul style="list-style-type: none"> • 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.

4.6.1 The Tone stimulus bar



- A. Symbol
- B. Frequency

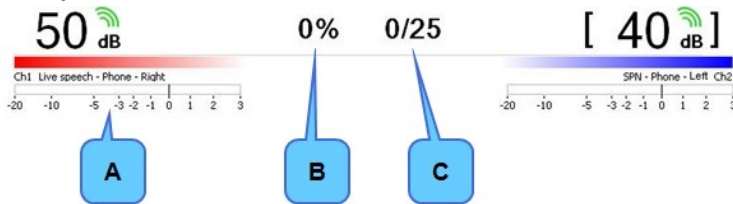
During online testing, the stimulus bar shows:

Symbol
<ul style="list-style-type: none"> Indicates the symbol that will be displayed on the audiogram(s) when a data point is stored. The symbol shown reflects the current audiometer measurement settings.

See also [Curves and symbols selection](#) ► 41.

Frequency
<ul style="list-style-type: none"> Indicated by the Hz value in the center of the stimulus bar.

4.6.2 The Speech stimulus bar



- A. VU meter
- B. Speech score
- C. Word count

During online testing, the stimulus bar shows:

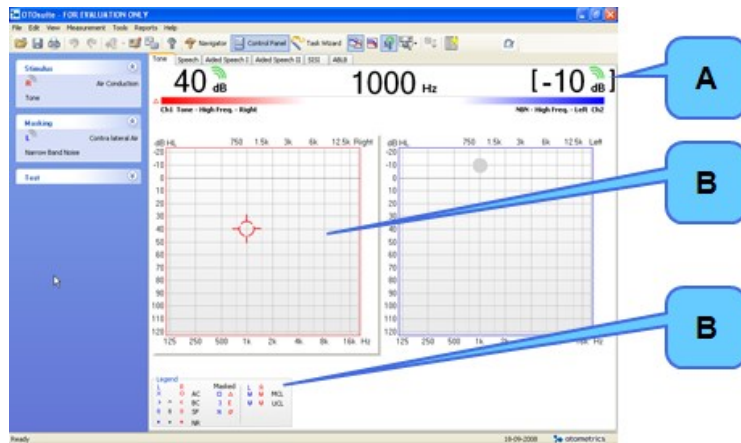
Speech Score/Word Count
<ul style="list-style-type: none"> Displays the percentage correct/incorrect and the amount of words correct/incorrect out of a given number of words. You can display speech score and word count either as “% Correct” or as “% Incorrect”. To set your preference, select Tools > Options > Speech > Misc. > Score Presentation. % Correct is the default setting.

VU Meter

- Displays the level (in volume units) of the test microphone or speech material from Source A or Source B. Speech should always be delivered at 0 dB on the VU meter so that the dB level on the stimulus intensity bar represents the level actually being delivered to the patient.

4.7 The Tone test screen

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



- A. Stimulus bar
- B. Work area
- C. Legend box

4.7.1 The work area in the Tone screen

The Tone test work area consists of a range of elements for viewing and selecting various features:

- [The audiogram ▶ 39](#)
With a description of audiogram elements, how to view single or dual graphs, and how to view the intensity levels used for masking.
- [The Legend box ▶ 43](#)
With a description of result boxes for special tests, utilities such as a timer and an overlays selector, and instructions for how to view/hide the feature boxes.

4.7.2 The audiogram


Audiogram elements

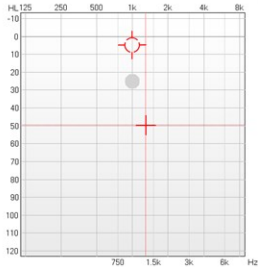
Cross hatch



Indicates your current stimulus level and frequency. The color indicates the routing:


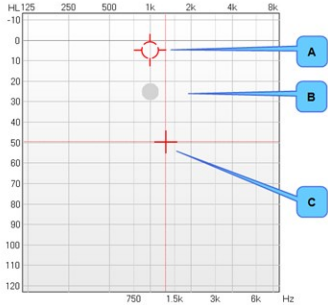
- Blue = left
- Red = right
- Black = binaural


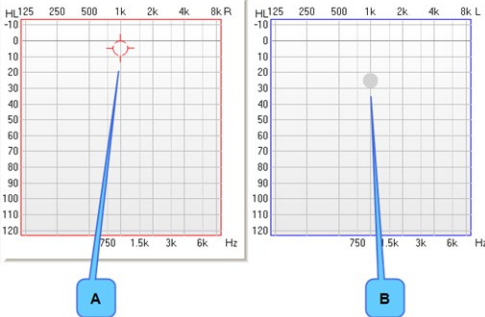
Mouse cursor	
	<p>Indicates where you place the mouse. The color indicates the routing:</p> <ul style="list-style-type: none"> • Blue = left • Red = right • Black = binaural

Audiogram	
	<ul style="list-style-type: none"> • Intensity is shown to the left of the audiogram in dB HL. • Octave frequencies are shown below the audiogram in Hz. • Interoctave frequencies are shown above the audiogram in Hz.

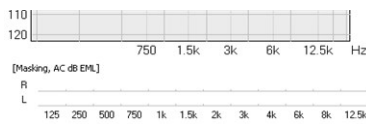
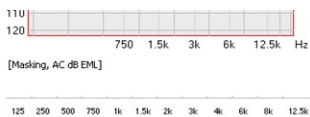
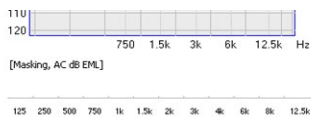
Viewing the audiogram

You can choose between:

Single graph view	
<p>A. Stimulus marker (ear color) B. Masking level indicator C. Mouse cursor (ear color)</p>	

Dual graph view	
<p>When you use the dual graph viewing option, the graph that corresponds with the stimulus ear will have a gray outline to denote the active audiogram.</p> <p>You can switch the position of the right and left graphs to correspond to your viewing preference.</p> <ol style="list-style-type: none"> 1. Select Tools > Options > Tone > Misc. > Dual Graph View or in the menu bar under View. <p>A. Stimulus marker (ear color) B. Masking level indicator</p>	

Viewing masking levels

Masking levels
<p>Below the audiogram, the intensity levels used for masking can be displayed. It is an option to display the masking levels. Select Tools > Options > Tone > View > Misc. > Masking Levels.</p>
<ul style="list-style-type: none"> • In combined view, the non-test ear masking levels are shown below the graph. <div style="text-align: center;">  </div>
<ul style="list-style-type: none"> • In Dual Graph View, the masking level used for masking the non-test ear is by default displayed under the graph for the test ear. The masking level can be set to be displayed either under the test ear or under the non-test ear: select Tools > Options > Tone > View > Misc > Masking Table Placement. <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>

4.7.3 Curves and symbols selection

You can select a symbol and/or a curve style for a specific measurement and you can create new symbols.

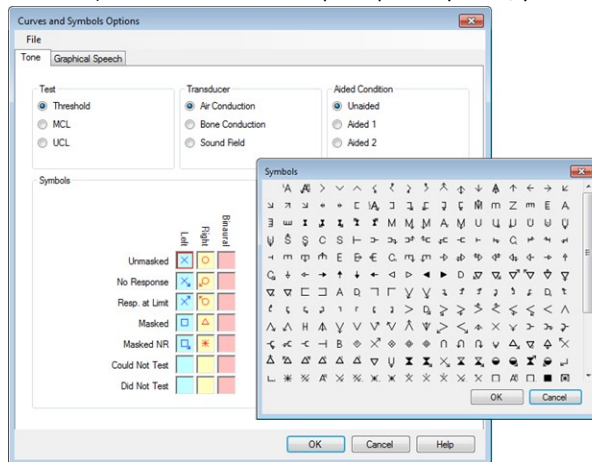
4.7.3.1 Selecting a symbol or curve

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

1. 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.



4.7.3.2 Creating new symbols

1. Use Microsoft Powerpoint to create graphics that can be saved in Enhanced Meta Files (*.emf) format.
2. The outer size of the EMF file must be less than or equal to 1 x 1 inches (2.5 x 2.5 cm).

Note • If the symbols are created larger, 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**.

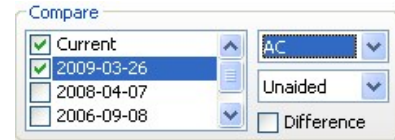
3. Before you store the new graphic, make sure that the outer and inner frames are invisible: Select the frame, and set the line color to **No Line**. Repeat this for each frame.
4. To save as an *.emf graphics file, select all elements in the drawing (including the invisible outer frame as well as the symbol itself centered within the frame). Right-click and select **Save as picture...**
5. Name the file and select the file type *.emf.
6. Save it in **C:\Program Files\GN Otometrics\OTOSuite\AudSymbols**.
7. Launch the OTOSuite Audiometry Module and select **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.

4.7.4 Compare audiograms

Make sure the feature box for **Compare Audiograms** is visible in the OTOSuite main view area (if not, set **Tools > Options > Tone > View > Show Compare Audiograms to On**).

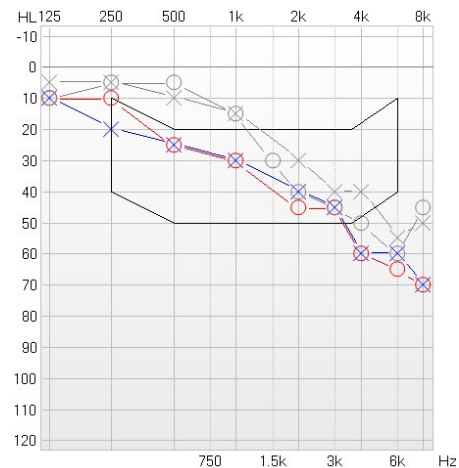


OTOSuite under NOAH

All sessions relating to the selected client, and containing audiometry data are automatically loaded into the **Compare Audiograms** feature box.

Compare current and historical audiograms

1. In the **Compare Audiograms** feature box, single-click to select the audiograms you wish to view from the list of historical audiograms. Any selected historical audiogram will appear with grey curves in the audiogram graph.
2. All curves of the selected audiograms are viewed and compared simultaneously unless you explicitly select a curve type from the feature box drop-down lists. The lists let you define the test type and aided condition that you wish to view and compare.
3. You can enhance the compare view by enabling the **Difference** view. This is done by checking the **Difference** option in the feature box. The **Difference** view highlights any difference between the most recent and any older audiogram curves selected in the list.



4. If you decide to make a new audiogram, then a new **Current** audiogram is generated in the **Compare Audiograms** feature box list, and what was previously the current audiogram consequently becomes a historical one, displayed with measurement date.
5. If you deselect the viewing of a **Current** audiogram so that it is no longer shown, then it will instantly be reselected if you try to edit a curve.
6. You can keep any previously collected audiogram visible in the graph while collecting the current audiogram simply by keeping it selected in the **Compare Audiograms** feature box while measuring.

4.7.5 The Legend box

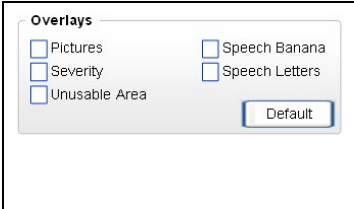
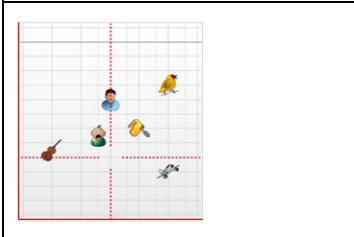
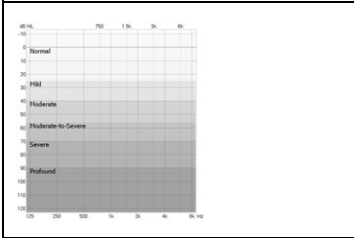
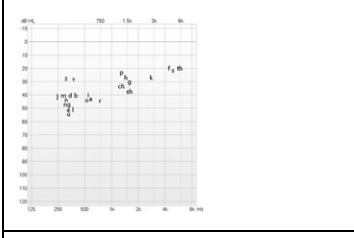
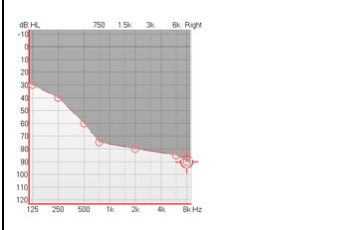
The Legend box shows the audiogram symbols used in the graphs.

4.7.6 Tone view options

You can access a number of Tone view options directly from the **Tone** main screen.

The view options can be turned on/off. To do so, select **Tools > Options > Tone**.

Overlays

	<p>Select the overlay to be displayed on the audiogram.</p> <p>These overlays assist in the counseling process.</p> <ul style="list-style-type: none"> • Select Tools > Options > Audiometry > Tone > Overlay Selection Box. <p>The overlay options are:</p>
	<p>Pictures</p> <p>Displays pictures representing common environmental sounds at their approximate dB level (e.g. bird, plane).</p>
	<p>Severity</p> <p>Displays the audiometric severity levels (normal, mild, moderate, moderate-to-severe, severe, profound).</p>
	<p>Speech Banana</p> <p>Displays the speech banana of a listener with normal hearing.</p>
	<p>Speech Letters</p> <p>Displays speech sounds at their approximate dB level.</p>
	<p>Unusable area</p> <p>Shades the area which is outside the patient's dynamic range of hearing.</p>



4.8 Work-flow related features

4.8.1 Selecting orientation

Select graph, table and control layout



Click **Select Orientation** on the toolbar to see the following dialog:

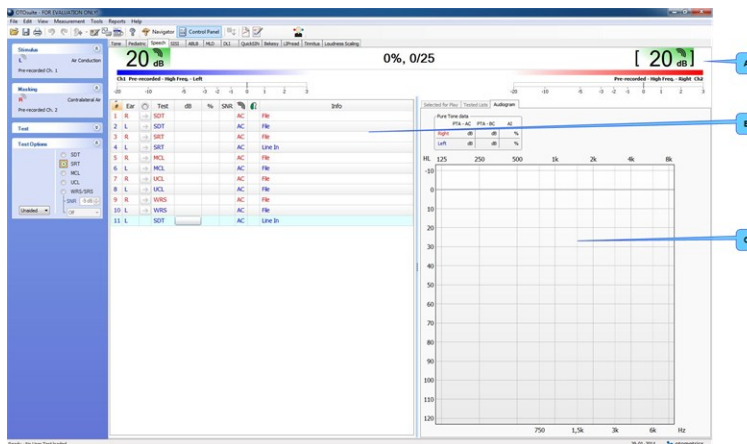
<p>Graphs and Tables</p> 	<p>Click to select the way you view the patient in relation to your monitor.</p>
<p>Control</p> 	<p>Click to select the position of the stimulus channel on the screen.</p>

4.8.2 Ear shift frequency and level setting

When you change test ear, you can define that the frequency and level should be set to 1000 Hz at 20 dB HL. To do so, select **Tools > Options > Tone > Measurement > Ear Shift Frequency and Level**. Check **Ear Shift Frequency and Level**.

4.9 The Speech test screen

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



- A. Stimulus bar
- B. Work area, tabular view
- C. Audiogram

4.9.1 The work area in the Speech screen

Selecting tabular or graphical view

In the Speech test screen of the OTOSuite Audiometry module you can use either tabular view or graphical view.

1. To select the view you wish to use, select **Tools > Options > Audiometry > Speech > Speech View Mode > Tabular View** or **Graphical View**.

The work area can be shown in two modes:

- [Speech testing - tabular view ► 47](#)
- [Speech testing - graph view ► 48](#)

4.9.2 Speech feature boxes

You can access a number of speech display options directly from the **Speech** main screen.

Feature boxes	
Pure Tone Data	Displays the pure tone average for air conduction and bone conduction as well as the articulation index. <ul style="list-style-type: none"> • To configure pure tone average (PTA) calculation, select Tools > Options > Audiometry > General > Misc. > PTA Frequency AC/BC. • The AI is calculated according to the “Count-the-dot” method.
Stenger	Displays the results of a speech Stenger test (optional). <ul style="list-style-type: none"> • Scoring options are positive (+) or negative (-).

4.9.3 Terms and abbreviations used in Speech testing

SDT	Speech Detection Threshold
SRT	Speech Recognition Threshold
MCL	Most Comfortable Loudness Level
UCL	UnComfortable Loudness Level
WRS/SRS	Word Recognition Score/Sentence Recognition Score
	<ul style="list-style-type: none"> • Score Percentage of correct/incorrect words.
	<ul style="list-style-type: none"> • Level dB level at which the words were presented.
	<ul style="list-style-type: none"> • [Msk] Effective masking level (dB EML) used for contralateral masking.
	<ul style="list-style-type: none"> • SNR Signal-to-Noise Ratio.

PTA	Pure Tone Average	
	• PTA - AC	Pure Tone Average for Air Conduction thresholds.
	• PTA - BC	Pure Tone Average for Bone Conduction thresholds.
AI	Articulation Index (%), based on the Count-the-dot method.	

4.10 Speech testing - tabular view



MADSEN Itera II is intended for use with predefined speech protocols that are loaded automatically when you select a user test.

You can have a full overview and instantly select measurement type, ear, transducer, stimulus type, routing, and speech material.

- If you wish to make manual changes on the fly, use the control panel to select.

The predefined tests are incorporated as rows in the speech table.

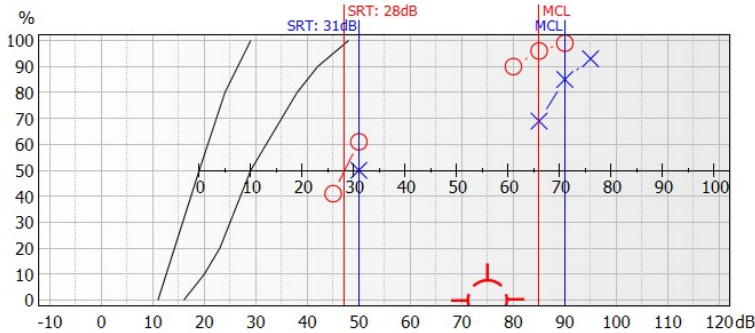
- To select a predefined test, simply click the button in the **Test** column. This will load all the speech settings and speech material.

#	Ear	Test	dB	%	SNR			Info
1	R	<input type="button" value="SDT"/>				AC	File	
2	L	<input type="button" value="SDT"/>				AC	File	
3	R	<input type="button" value="SRT"/>	Store			AC	File	
4	L	<input type="button" value="SRT"/>				AC	File	
5	R	<input type="button" value="MCL"/>				AC	File	
6	L	<input type="button" value="MCL"/>				AC	File	
7	R	<input type="button" value="UCL"/>				AC	File	
8	L	<input type="button" value="UCL"/>				AC	File	
9	R	<input type="button" value="WRS"/>				AC	File	
10	L	<input type="button" value="WRS"/>				AC	File	
11								

If you perform a test which is not available in a predefined Speech table, a speech row is created automatically. This temporary row will exist as long as there is stored test data for that measurement setup.

4.11 Speech testing - graph view

General description



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

For SRT and WRS/SRS, or WRS/SRS with noise, symbols will be shown based on the location corresponding to the dB level of presentation and the percentage of correct responses.

The graphical speech legend

The graphical speech legend shows the measurement conditions for testing and displays the corresponding symbols from the graph. The legend rows are color coded according to their respective routing.

The legend adapts to the tests and adds a row for each measurement you make. You can also pin tests so that they are readily available for future testing.

Adaptive rows

The rows in the adaptive legend always show the current measurement settings and the measurements you have made. A new row will be added to the legend every time you make a new test.

Example

#	Curve	Ear	SNR	Info
1	SRT × □ L	AC	File	

The adaptive Speech legend showing the current measurement settings. Data has not been stored at this point.

#	Curve	Ear	SNR	Info
1	SRT → × □ L	AC	File	
2	SRT → ○ △ R	AC	File	
3	WRS → ○ △ R	AC	File	
4	WRS × □ L	AC	File	

The adaptive Speech legend showing the three first measurements followed by a blank row with the current measurement settings ready to be stored.

Pinned rows

#	Curve	[]	Ear	SNR			Info
1	→ SRT	○ △	R		AC	File	
2	→ SRT	× □	L		AC	File	
3	→ MCL		R		AC	File	
4	→ MCL		L		AC	File	
5	→ WRS	○ △	R		AC	File	
6	→ WRS	× □	L		AC	File	

You can pin a row to make it available in advance in order to reflect the measurements usually performed in your clinic. A legend with pinned rows will always look the same when you start testing a new patient.

This customized layout provides you with a consistent work environment and makes it easy to see what to do next, or if any test has been deliberately left out.

A test that is not pinned to the legend is added automatically below the pinned rows.

Click 'n' Get

The Click 'n' Get feature allows you to perform a test from the predefined legend simply by clicking the **Apply Settings** arrow button in the second column of the legend. Click 'n' Get loads all the relevant settings including the integrated speech files.

Pinning a test

You can pin one test per measurement condition.

Note • You can pin a test to the legend, if you have not already pinned an identical test. To edit a pinned test, make sure that User Tests are not write protected in the Configuration Wizard.

To pin a row, simply select the row, right-click and select **Pinned Tests > Pin Test**. Here you can also rearrange pinned rows by moving them up or down in the legend.

Modifying Click 'n' Get for a pinned test

You can assign a different speech stimulus and/or transducer to a pinned test. This will load the desired word list, transducer, etc., when you use the Click 'n' Get feature.

Changing assigned speech stimulus for a pinned test

1. Select the speech stimulus, such as a specific integrated word list, or internal CD or line-in device, in the Control Panel and/or speech player.
2. Right-click on the **Apply Settings** button in the pinned test row, and select **Assign Selected Stimulus**.

Changing an assigned transducer for a pinned test

1. Select the transducer in the Control Panel.
2. Right-click on the **Apply Settings** button in the pinned test row, and select **Assign Selected Transducer**.

Note • When you use Click 'n' Get to apply settings, the AC transducer as well as the speech stimulus are loaded as your preferred starting point. You can always adjust them in the Control Panel or in the Speech Player panel.

Example 1:

You typically use insert phones but you have a patient with an ear infection and you wish to use supra-aural headphones. Use Click 'n' Get to load the desired test, and simply switch to Phone in the Control Panel before you start the test.

Example 2:

You typically wish to start the Speech test by familiarizing the patient with a specific word list before starting the actual test with a different word list. Use Click 'n' Get to load the desired starting point, and simply switch to any word list you wish to use after the familiarization.

Storing data in a row

To store data in a row, click the **dB** field in the relevant row or press **S** on your keyboard.

The Info field

The **Info** field provides additional information such as a stimulus source (e.g. CD, Live, File, or specific speech material), as well as noise condition, and your own comments if desired. To add your own comments, right-click the **Info** field.

Editing a row

Click on the data you wish to edit and use the right-click menu to change the value.

Deleting a row

Right-click on the field you wish to delete and select **Delete Measurement**.

5 Preparing for testing

It is important to prepare properly before making measurements with MADSEN Itera II and the OTOSuite software. It is time-saving for both you and the client if the environment, the client, the test device, and the software are ready for the test.

5.1 Preparing the test environment

Before you start testing, make sure that the test environment is conducive to testing.

- The test environment should be quiet, preferably in a sound proof booth, for accurate threshold results.
- The test room or sound booth should have a minimum of furniture and hard surfaced articles (i.e. filing cabinets, tables etc), as these can cause reverberation during sound field testing. Live voice examinations are best carried out when using a sound booth, so that the client/patient cannot hear the tester's voice directly. With tester and client/patient in the same room, especially of clients with normal or almost normal hearing, false results could be obtained.

Furniture

The test environment should include

- a comfortable chair for the client,
- a child-sized chair if testing pediatrics,
- a comfortable chair for the assistant.

The examiner should be able to see the client/patient. The client/patient should be seated so that it is not possible to see what the examiner is doing or how the equipment is being operated. This reduces the likelihood that the client/patient can anticipate when the stimulus will be presented.

For pediatric testing consider using a highchair, which is a familiar environment for most children and will place them closer to eye level with the visual reinforcement toys. Make sure if performing visual reinforcement audiometry that the reinforcing toys can be seen by the child. A child cannot look over and up at a toy until approximately 9 months of age.

Lighting

The lighting in the booth should be bright enough for the examiner to adequately see the client.

Toys

If testing pediatrics, several interesting toys are needed to center the child (obtain the child's attention toward the assistant or tester) prior to stimulus presentation. It is best if these toys do not produce sounds.

The child should be conditioned to respond to the sound of the stimulus only. Competing sounds from toys can confuse the child and reduce the reliability of the test.

Soft toys are needed to keep a young child's attention during behavioral observation or visual reinforcement audiometry. Younger children like to tap the toy on the highchair tray and therefore a toy that does not create much sound would be more appropriate during testing.

Blocks, buckets, puzzles are needed to keep a child's attention during play audiometry.

5.2 Preparing the test equipment

Make sure that you have connected the required accessories:

- headphones. To connect, see [Air conduction](#) ► 104.
- insert phone(s). To connect, see [Air conduction](#) ► 104.
- bone conductor. To connect, see [Bone conduction](#) ► 105.
- external microphone. To connect, see [External microphone](#) ► 105.

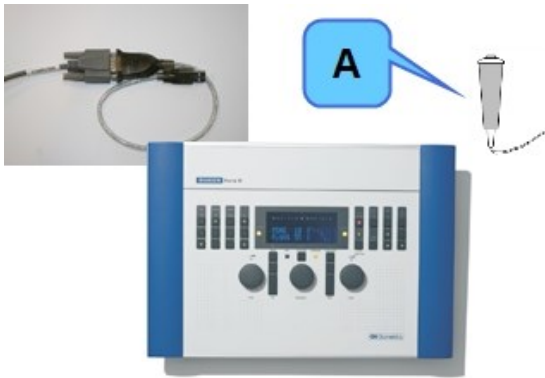
- free field equipment. To connect, see [Free Field ▶ 105](#).
- patient responder ([Socket connections - rear panel ▶ 26](#)).

5.2.1 Connecting the cables of the test equipment

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

USB/RS232 connection

For PC or Laptop with USB port or RS232 cable for PC or Laptop with serial port.

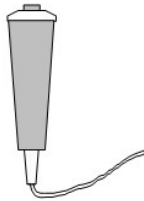


A. Patient responder

Free-field

See [Free Field ▶ 105](#) for a description of how to connect to MADSEN Itera II.

5.2.2 The patient responder



- Place the patient in a sound booth, if one is available, and facing away from MADSEN Itera II.
- Instruct the patient in how to use the patient responder.
- 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 presses the responder.

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 the device

See [Installation ► 103](#) for a description of how to connect headphones and insert phones to the device.

Fitting on patient

- Place the patient facing away from the device, 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 ([Input - MIC, CD, REVERSE ► 18](#)).
- 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 responder ([The patient responder ► 52](#)).
- The patient should press the patient responder as soon as the tone is heard, even if it is very weak.

5.2.4 Preparing for bone conduction testing

Make sure that the bone conductor is properly connected.

Fitting the bone conductor on the 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 cable must not be removed or tampered with while MADSEN Itera II is powered on. Either disconnect the bone conductor or insert phone 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 MADSEN 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.
- 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 MADSEN Itera II is calibrated for this, see **SETUP, SETUP items ► 87** 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 responder.
- The patient should press the patient responder 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 [Air conduction with masking - suggested procedure](#) ► 64 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 raises a hand to indicate in which ear the tone was heard. This is particularly relevant since masked testing is used to determine that the signal is perceived by the test ear.

5.3 Listening check

Perform listening checks routinely to make sure that the equipment is functioning properly.

- Use a person who has auditory thresholds below 10 dB and make sure that he or she can hear a very faint sound for each stimulus type, frequency and for each transducer at 0 to 5 dB.
- If the person cannot hear the stimulus, contact the manufacturer or local representative to troubleshoot the system.
- It is recommended that the system be calibrated annually or according to the local requirements.

5.4 Preparing the client

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.

5.4.1 Hygienic precautions

It is important that hygienic precautions are taken to protect the client from cross-infection. Be sure to follow any established infection control procedures for the setting in which you are working.

- *Headphones*
Clean the headphones between patients, e.g. with a non-alcohol based antibacterial wipe, such as Audiowipes.
- *Insert earphones*

Warning • To prevent cross-infection, use new eartips when you test the next client.

5.4.2 Inspecting the client's ear(s)

1. Position the client so that you can easily access the client's ear(s).
2. Grasp the pinna and gently pull it back and slightly up and away from the client's head.
3. Inspect the ear canal and make sure that you can see the ear drum.
If you can see apparent narrowing of the ear canal, it may be blocked by vernix or debris, or it may not be straight.
4. If the ear canal is blocked, for instance by vernix or debris, the outcome of the procedures may be affected.
Clean the ear canal if required.

5.5 Preparing the Audiometry Module for testing

MADSEN Itera II and the Audiometry module

- Make sure the cables of the test equipment are connected correctly.
- Launch OTSuite and the Audiometry module on the PC (see the OTSuite User Guide).
- Make sure MADSEN Itera II is switched on.
- Make sure the connection between the Audiometry module and MADSEN Itera II is enabled.

Fetch multiple test results

- If you have done off-line testing with MADSEN Itera II, you can fetch test results from the audiometer.
See [Transferring test results from the audiometer to the PC](#) ► 83.

Test types

- **Manual air conduction testing**
To perform manual air conduction testing, see [Tone testing](#) ► 59.
- **Bone conduction testing**
To perform bone conduction testing, see [Bone Conduction threshold test](#) ► 60.

- **Speech testing**
To perform speech testing, see [Speech testing](#) ► 67.
- **Special tests**
 - [MCL tone testing](#) ► 73
 - [UCL tone testing](#) ► 73
 - [SISI \(Short Increment Sensitivity Index\)](#) ► 73,
 - [ABLB \(Alternate Binaural Loudness Balance\)](#) ► 75,
 - [STENGER Test](#) ► 76,
 - [Hearing Instrument Simulation \(HIS\)](#) ► 77

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

5.6 Proper transducer placement

Headphones

1. Loosen the headband and place both the left and right side of the headphones simultaneously.
2. Make sure that the blue indicator is on the left ear and the red indicator is on the right ear. The center of the headphone diaphragm should be directly opposite the opening of the ear canal for the left and right side.

Note • *If the headphones are not placed properly, there is risk of causing the ear canal to collapse which will result in elevated thresholds.*

3. Ask the patient if the headphones are comfortable.
4. Tighten the headband while holding the headphones in place with your thumbs.
5. Examine the placement of the headphones to make sure they are level, and properly positioned.

Insert Earphones

Young children tolerate insert earphones better than headphones.

The insert earphones are color-coded:

- the blue indicator for the left ear,
- the red indicator for the right ear.

1. Select the largest foam eartip that will fit into the patient's ear.

If the eartip is too small the sound will leak out and the dB level will not be accurate at the eardrum.

Insert earphones have greater attenuation between ears especially at the low frequencies; this reduces the need for masking.

2. It is best to clip the insert earphone transducers behind the child or on the back of their clothing and then fit the foam eartip into the child's ears.

If the foam eartip is a little too large, consider cutting it down to make it a little smaller.

Bone Oscillator

Note • *For unmasked bone thresholds, you can store binaural data:*

Note • If there is a difference of 10 dB or greater between the bone conduction threshold and the air conduction threshold of the same ear, masking is needed. The Masking Assistant can assist you in determining which thresholds need to be masked.

Note • If the SRT of the test ear and the SRT or PTA of the nontest ear differ by 45 dB or more, masking is needed.
If the SRT of the test ear and the bone conduction PTA of the nontest ear differ by 45 dB or more, masking is needed.

Mastoid placement

1. Move any hair covering the mastoid out of the way and place the flat round part of the bone oscillator securely on the bony portion of the mastoid without any part of the transducer touching the external ear.
2. Make sure the bone oscillator is tight on the mastoid but still comfortable.
3. If you are going to perform masking with earphones, position the other end of the bone oscillator headband over the patient's temple on the opposite side of the head so that the headband of the earphones and bone oscillator fit on the patient's head.

Frontal bone placement

1. For frontal bone placement, place the flat round part of the bone oscillator securely on the middle of the forehead about an inch (2.5 cm) below the hairline.
2. Make sure the bone oscillator is tight on the forehead but still comfortable.

6 Tone testing

6.1 Air Conduction threshold test

Modified (ascending) Hughson-Westlake.

Prerequisites

- Press **TONE**.
- Press **AC**.
- If needed, select **WARBLE** or **PULSE** as stimulus type (an advantage when you test children).
- If you want to predefine the duration of the signal presentation when you press the **INT** button, press **IMPULSE**.
- If you wish to use masking, select the masking type: Press **MASK ON**. See also [Testing with masking ► 62](#).
- If required, turn the **FREQUENCY** knob to set the starting frequency: The typical starting frequency is at 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 Responder to the patient and explain how it should be operated (see [The patient responder ► 52](#)).

6.1.1 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 [Store/toggle threshold status ► 23](#).
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 [SETUP items ► 87](#).

- 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.

- Continue to press **STORE** after each threshold is found to store that particular threshold.
- 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.
- If you are not performing the test online with the OTOSuite Audiometry Module, plot the results in an audiogram sheet.
- Repeat this procedure for the other ear.

Note • If there are differences between the thresholds in the two ears, see [Testing with masking ▶ 62](#).

6.1.2 Sound Field testing

When you select SF transducer, and Free Field speakers (F.F.) are assigned as transducers (**SETUP**, [SETUP items ▶ 87](#)), the results are stored as an individual threshold curve using the applicable Sound Field symbols ([Display ▶ 13](#)).

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 MADSEN 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.

Prerequisites

- Press **TONE**.
- Press **BC**.
- If needed, select **WARBLE** or **PULSE** as stimulus type.

- 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 [Preparing for bone conduction testing ▶ 53](#).
- 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 Responder to the patient and explain how it should be operated (see [The patient responder ▶ 52](#)).
- 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 you wish to use masking, see [Testing with masking ▶ 62](#).
- If needed, 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.

6.2.1 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 [Store/toggle threshold status ▶ 23](#).
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 [SETUP items ▶ 87](#).

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. 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 [Testing with masking ▶ 62](#).

6.3 Testing with masking

To prepare the patient for masking, see [Preparing for testing with masking ▶ 54](#).

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 [Testing with masking ▶ 62](#).

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.

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

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**, **SETUP items** ► 87.

The test procedure is similar to that described in [Bone conduction with masking - suggested procedure](#) ► 64.

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)
500	44	Munro & Agnew, BJA (1999)
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	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)

Hz	dB	Source
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 [Air Conduction threshold test ► 59](#).

Prerequisites as in [Air Conduction threshold test ► 59](#).

- Prepare the patient for testing with masking. See [Preparing for testing with masking ► 54](#).
- 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 [Bone Conduction threshold test ► 60](#).

- Prepare the patient for testing with masking. See [Preparing for testing with masking ► 54](#).

- 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 needed, test the remaining frequencies in the same way and switch to the other ear.

6.4 Storing thresholds

To use the store button, see [Store/toggle threshold status ► 23](#).

Results can be stored on a PC when MADSEN Itera II is used with the OTOSuite Audiometry module.

7 Speech testing

1. Prepare the patient for testing as described in [Preparing for testing ► 51](#).
2. To select Speech testing press **SPEECH**.
3. You can now proceed with:
 - [Monaural Speech testing ► 67](#), or
 - [Binaural Speech testing ► 69](#)

7.1 Monaural Speech testing



1. When you select Speech testing, the display shows the following:
 - the VU meter for the test signal in the top line of the display,
 - a speech counter to count the number of words heard correctly or incorrectly by the patient,
 - indication of any masking signal,
 - the intensity for left and right ear, shown in the bottom line.

7.1.1 Selecting input

Selecting microphone or CD input

1. 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 ► 68](#)), 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 a MADSEN 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 goose-neck 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:

1. 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.

2. If you wish to switch between all available inputs, turn the frequency selector while you press **MIC.** or **CD.**

This will give 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

If you wish to operate MADSEN Itera II as a one-channel or a two-channel speech audiometer, 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 monaural testing (default)**

CD_1 is the default input channel for right or left ears. Masking is available for the opposite ear.

- **Two-channel monaural testing**

This test requires special routing. See [Special Speech routing](#) ► 70.

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 testing

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).

1. To adjust the masking signal type selection, select **SETUP**, [SETUP items](#) ► 87.



7.1.3 The counter function in speech testing

There are three ways of counting words in a Speech test. To select the counting method, select **SETUP**, [SETUP items ▶ 87](#).

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
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 testing

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



1. 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 [Selecting input ▶ 67](#).

7.2.1 One-channel or two-channel Speech testing

To select one or two input channels, see [Selecting input](#) ► 67.

If you wish to operate MADSEN Itera II as a one-channel or a two-channel Speech audiometer, 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.

Caution • You should only use speech materials with a stated relationship between the level of the speech signal and the calibration signal.

Speech materials delivered on CD or other media are normally accompanied by a description of this relationship. You should follow the instructions supplied with the speech materials, using the VU-meter in OTOSuite for adjustment of input gain.

If you are using built-in speech materials supplied with OTOSuite, the speech levels have been adjusted according to the original speech material instructions.

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 [Binaural Speech with masking](#) ► 71).

- 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.

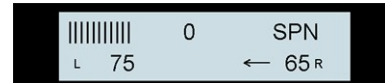


- Press once more to send the input to each ear in the normal way. The arrow disappears.

7.3.2 Speech in Noise

Adjusting the masking dB level

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



Switching masking noise to other ear

1. 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

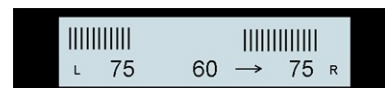
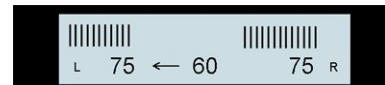
Note • Binaural masking is not possible in BC testing.

1. 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.

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

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

For a description of how to test a patient and record an audiogram, see [Tone testing](#) ► 59.

8 Special tests

1. Prepare the patient for testing as described in [Preparing for testing](#) ► 51.
2. Press **SPECIAL**. The available special tests are shown in groups of three on the display. If the MADSEN Itera II is configured with more than three special tests, press **SPECIAL** until you see the test you wish to use. If **SPECIAL** flashes, more tests are available.
3. Press the function key below the test you wish to perform.
The three tests last used will always be displayed first when you press **SPECIAL**.

8.1 MCL tone testing

1. 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

1. 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 (Short Increment Sensitivity Index)

The SISI Test was developed by Jerger and co-workers (Jerger, Shedd, and Harford, 1959) and was introduced as a procedure that was reliable and reasonably objective.

The test consists of superimposing brief bursts of 1 dB intensity increments on a sustained tone presented monaurally through earphones at a sensation level of 20 dB at each tested frequency.

The patient is instructed to report any jumps in loudness detected while listening to the sustained tone for a period of about two minutes.

Selecting the test

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

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.



	20	SISI	0%
L	0	1000	0.25 R


2. To set the number of increments for the test, press **SETUP** once and use the **Right level** knob.
3. To start the SISI test press **START/STOP**.

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 responder to register each increment that has been heard.
- *Manual scoring*
If the patient is unable to use the patient responder, 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.

Stopping 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.

	20	xSISI	0%
L	0	1000 *	0.25

- Test the next frequency.

8.4 ABLB (Alternate Binaural Loudness Balance)

In this 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 indicates this by pressing the patient responder.

- To select the test press **SPECIAL** once or more until ABLB is shown.
- Press **ABLB** once, and the test display is shown.
The top line shows the intensity for Right and Left channel and the test name.

	20	ABLB	15
L	1000	2.25Hz	R

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

Changing alternating frequency

To change the alternating frequency:

- Press **SETUP** once and use the **Right level** knob (0.25 - 2.5 Hz).
- Press **SETUP** again to implement the new setting.
- 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 [Stimulus/speech count buttons ▶ 24](#)).

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, the message "No more STORE" is shown.

- 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 is stored, you cannot just change the signal type. If you do, the system will not save the 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).

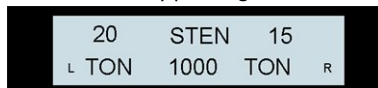
Masking

Note • The audiometer cannot perform masking during this test.

8.5 STENGER Test

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

- Before you perform a Stenger test, measure the patient's tone thresholds for the left and right ears.
- To select the Stenger test press **SPECIAL** (one or more times) until "STEN" appears.
- 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 ► 76](#)

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

Changing dB level

- 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.
- 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 [Stimulus/speech count buttons ► 24](#)).

Changing stimulus

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).

1. Press **WARBLE** to activate or deactivate (see [Signal column ► 18](#));
2. Activate Narrow Band Noise (to activate press **MASK ON** or **MASK LOCK**, to deactivate press **MASK OFF**). See [Masking ► 20](#).)

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 [The HIS procedure ► 77](#).

A brief description

MADSEN Itera II provides an immediate way of demonstrating how helpful amplification can be. For this purpose, the basic simulation described below is quite sufficient in most cases.

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

The filter characteristics 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.

8.6.1 The HIS procedure

Connect accessories

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

Audiogram

- Use an audiogram stored in MADSEN Itera II.

or

- Enter an audiogram in MADSEN Itera II.

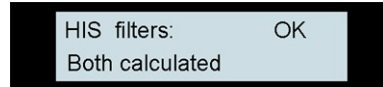
Prepare the patient

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

Select test

1. Press **SPECIAL** (twice, if needed) until **HIS** is shown on the display.
2. Press the relevant function key to select **HIS**.
3. One of the following messages will appear:

Sufficient audiograms are available for both ears



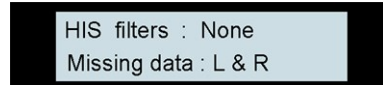
Sufficient audiogram is available for one ear only (in this case the Right ear).

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 ([Manually adjusting the HIS filters ▶ 80](#)).



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

Adjust input sensitivity

- Adjust the input sensitivity ([Adjusting input sensitivity ▶ 70](#)).

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 (One-channel or two-channel Speech testing ▶ 70)
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 ▶ 78

- 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" ▶ 79](#).

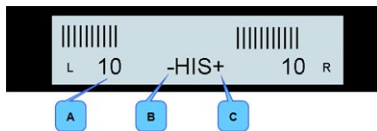
Muting the simulator

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.



- A. Master volume
- B. No filter activated
- C. Filter activated

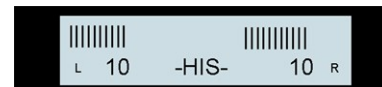
Adjusting HIS "Master Volume"

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 **leftLEVEL** 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 **rightLEVEL** 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.

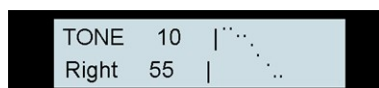
Example:

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



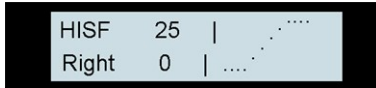
8.6.2 Viewing thresholds and filters

- 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.



- If the simulation is not satisfactory, use the manual procedure described in [Manually adjusting the HIS filters](#) ► 80 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 [The HIS procedure](#) ► 77 this is done automatically.

If you wish to change the HIS filter parameters for the left or right ear, press either the **left** or **right INT** button. The filter characteristics for the selected ear are shown.



The top line shows

- the selected ear
- whether the currently displayed parameters apply to the filter for
 - low pass (LP ), or
 - high pass (HP ).

The second line shows

- the filter's 3 dB cut-off frequency
- the filter slope (in dB per octave)
- 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 [The HIS procedure ► 77](#), and [The HIS procedure ► 77](#) to continue the procedure.

Filter examples

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

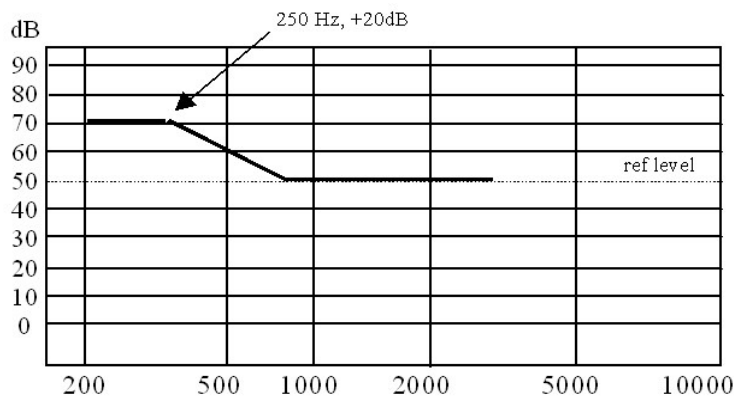


Fig. 2 Low pass filter graph

[Fig. 2 ► 81](#) shows a graph where the characteristics of a low pass (bass) filter are set to an amplification of +20dB for frequencies under 250 Hz.

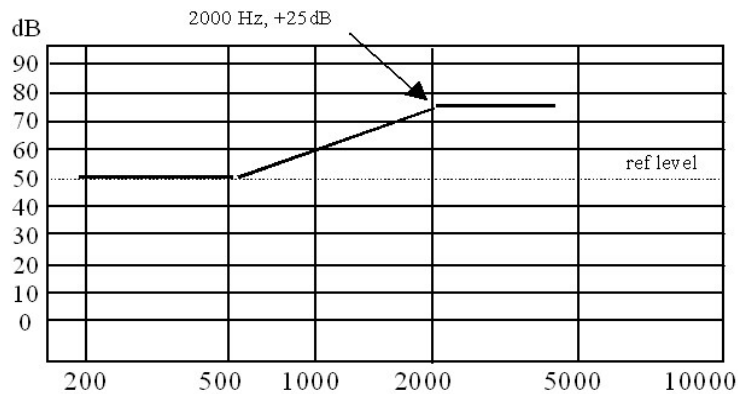


Fig. 3 High pass filter graph

[Fig. 3 ► 81](#) 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. 4 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

From the PC you can print audiograms that have been saved in the OTOSuite Audiometry Module.

10 Setup of parameters

10.1 What does SETUP do?

You can use **SETUP** to define all of the normal parameters and setups in the audiometer.

Permanent changes

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

- [How to use SETUP ▶ 85](#)
- [SETUP items ▶ 87](#)

Temporary changes

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

- [Temporary changes in the setup ▶ 86](#)

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** knob 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** knob.
4. Changes made under **SETUP** will be saved when you leave **SETUP**, and will apply the next time MADSEN 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 [SETUP items ▶ 87](#).

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 MADSEN Itera II is switched off.

- [Signal column ▶ 18](#)
- [Signal column ▶ 18](#)
- [Signal column ▶ 18](#)
- [Signal column ▶ 18](#)
- [Input - MIC, CD, REVERSE ▶ 18](#)
- [Talk over ▶ 22](#)
- [Talk over ▶ 22](#)
- [Talk over ▶ 22](#)
- [Talk over ▶ 22](#)
- [Talk back ▶ 20](#)
- [Masking ▶ 20](#)
- [Masking ▶ 20](#)
- [Frequency ▶ 25](#)
- [Warble modulation ▶ 23](#)
- [Signal type, SISI ▶ 23](#)
- [Master volume, HIS ▶ 23](#)
- [Stimulus/masking intensity knobs ▶ 23](#)
- [Talkback level ▶ 24](#)
- [Warble modulation, amplitude ▶ 24](#)
- [Pulse frequency ▶ 24](#)
- [Impulse time ▶ 24](#)
- [Input sensitivity, speech ▶ 24](#)
- [Word counting method, speech ▶ 24](#)
- [Alternating Fowler frequency ▶ 24](#)
- [Master volume, HIS ▶ 24](#)
- [Parameter selection, SETUP ▶ 24](#)
- [Power out voltage ▶ 24](#)

10.3 SETUP items

SETUP items:

- 1 SAVE TEST SETUP ▶ 88
- 2 SET DEF. TEST P. ▶ 88
- 3 AC TRANSDUCER ▶ 88
- 4 BC TRANSDUCER ▶ 88
- 5 SF TRANSDUCER ▶ 88
- 6 AC MASKING ▶ 88
- 7 BC MASKING ▶ 88
- 8 SF MASKING ▶ 89
- 9 MASK. PRESENT. ▶ 89
- 10 TONE MASK. SIG. ▶ 89
- 11 SPEECH MASK. SIG. ▶ 89
- 12 SPEECH COUNT ▶ 89
- 13 FREQ.CH.AT STORE ▶ 89
- 14 DB LEV. NEW TRA. ▶ 91
- 15 DB LEV. NEW FREQ ▶ 9116 MASKING LEVEL ▶ 94
- 17 PULSE FREQUENCY ▶ 94
- 18 IMPULSE LENGTH ▶ 94
- 19 WARBLE MOD. SIZE ▶ 94
- 20 WARBLE FREQUENCY ▶ 95
- 21 SELECT AC FREQ. ▶ 95
- 22 SELECT BC FREQ. ▶ 95
- 23 SIGNAL UNIT ▶ 95
- 24 MIC INPUT SENSE ▶ 95
- 25 CD INPUT SENSE ▶ 95
- 26 TALK OVER ▶ 96
- 27 TALK BACK MIC. ▶ 96
- 28 MONITOR ON/OFF ▶ 96
- 29 MONITOR LEFT ▶ 96
- 30 MONITOR RIGHT ▶ 96
- 31 LIGHT INTENSITY ▶ 96
- 32 INTERNAL BEEP ▶ 96
- 33 EXT. RANGE ▶ 96
- 34 EXT.R. dB-SPACE ▶ 97
- 35 BAUDRATE ▶ 97
- 36 CD POWER SUPPLY ▶ 97
- 37 DISPLAY ▶ 97
- 38 STIMULI KNOB ▶ 97
- 39 DEFAULT SETTING ▶ 97

- 1 SAVE TEST SETUP** Saves a test setup, e.g. masking ON, signal type WARBLE and presentation REVERSE, so that this setup is used the next time the device is switched on. To use this item, press **STORE**.

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

- 2 SET DEF. TEST P.** Activates the default setting for the relevant test. All settings are set to the "default" values; for the THR test for example, 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 [39 DEFAULT SETTING](#) ► [97](#) afterwards. To use this item, press **STORE**.

- 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!*

- 4 BC TRANSDUCER** Choose between calibrated bone conductors:

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

- 5 SF TRANSDUCER** Choose between calibrated headphones/free-field loudspeakers:

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

- 6 AC MASKING** Select masking transducer for AC:

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

- 7 BC MASKING** Select masking transducer for BC
- — (None)
 - AC TRANSDUCER
 - SF TRANSDUCER

8 SF Select masking transducer for SF

MASKING

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

9 MASK. Set mode for masking interrupter:

PRESENT.

- | | |
|-----------------------|--|
| 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. |

10 TONE Select masking stimulus for Tone test

MASK. SIG.

- NBN
- WBN

11 SPEECH Select masking stimulus for Speech test

MASK. SIG.

- SPN
- WBN

12 SPEECH COUNT Select number of words in a list, and select counting method. For further details, look under speech audiometry in [Speech testing](#) ► 67.

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

13 Method for frequency change when you press **STORE**.

FREQ.CH.A-T 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	

- **WRAP**
If 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	

- **BUTTERFLY**

If 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...
...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...

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

NEW TRA.

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

15 DB LEV. Choice of initial intensity when changing frequency.

NEW FREQ

- **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...
...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...
...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...

16 MASKING LEVEL Choice of whether the level remains at its current value (Manual) or automatically adjusts to the threshold of the opposite ear (Automatic):

- Manual or Automatic

17 PULSE FREQUENCY Choice of pulse frequency:

- 0.25 to 2.50 Hz

18 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 seconds

19 WARBLE MOD. SIZE Set modulation size as a %:

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

20 WARBLE 1 Hz to 20 Hz

FREQUENCY

21 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.

22 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.*

23 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.

24 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.

25 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.

26 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.

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

28 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.

29 MONITOR LEFT Selection of volume for left monitor.

30 MONITOR RIGHT Selection of volume for right monitor.

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

32 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

33 EXT. RANGE

Selection of one of three modes (see description in [Extended range ► 19](#)):

- 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.

Options: OFF, 20 seconds to 120 seconds

Default: Auto.

34 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.

35 BAUDRATE Selection of baud rate for RS232 interface.

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

36 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.

37 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. |

38 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. |

39 DEFAULT SETTING Sets all SETUP parameters to default.

- Press **STORE**.

The default values are:

10 Setup of parameters

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: MASKING LEVEL	Manual
17: PULSE FREQUENCY	1.50 Hz
18: IMPULSE LENGTH	1.50 seconds
19: WARBLE MOD.SIZE	5%
20: WARBLE FREQUENCY	5Hz
21: SELECT MANU.FREQ	All frequencies on
22: SELECT AUTO.FREQ	All frequencies on
23: SIGNAL UNIT	HL
24-27	Half gain
28: MONITOR ON/OFF	Tone On, Speech On, Masking Off
29 - 31	Half gain
32: INTERNAL BEEP	ON
33: EXT.R. TIMEOUT	Off
34: EXT.R. dB-SPACE	30 dB below max.
35: BAUDRATE	19200 Baud
37: DISPLAY	Fix signal on Left
38: STIMULI KNOB	Fix signal to Left

11 Configuring the Audiometry Module

You must run the **Configuration Wizard** before you can use the Audiometry Module and the audiometer for the first time. You can also use the wizard later to change specific settings or, for example, to repair the connection between the Audiometry Module and the audiometer.

1. Select **Tools > Configuration Wizard...**
2. Click on **Configure...** next to **Audiometry**.
3. Enter your selections and click on **Next** to continue the configuration or **Finish** to return to the **Applications** page of the configuration wizard.

Audiometers	
Connect to the device you wish to use for testing.	<ul style="list-style-type: none">• Click on the device you wish to use.<ul style="list-style-type: none">– If the device is not listed, check the check box My device is turned on and ready to be found, and click on Search.

Test Type	
Show "test type"	<ul style="list-style-type: none">• Click to enable viewing any of these test types as a test tab selection on the Audiometry test screens. 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.

Masking Assistant	
Masking Criteria	Define the masking criteria for insert phone(s), earphones, and high frequency earphones (if applicable).
Air-Bone Gap Criterion	Set the dB level for the Air-Bone gap criterion.

12 Communicating with the device

Connecting to the device

OTOSuite is designed to communicate with and display test data generated by Otometrics test devices.

- When you start up OTOSuite, click on the **Control Panel** icon. OTOSuite will automatically connect to the test device.
- See also the section "Activating the Control Panel" in the OTOSuite User Guide.

Firmware update

If a Firmware Update message appears, see:

- [Updating device firmware ► 100](#)

Information about the test device

To see information relating to the test device, select **Help > About Device**.

12.1 Reconnecting to the device

If the control panel for a test type is shown, and communication with the selected test device is interrupted, a message appears stating that there is no longer connection to the device.

- Click the **Connect** button on the **Control Panel** to reconnect to the selected test device.

Information about the test device

To see information relating to the test device, select **Help > About Device**.

12.2 Updating device firmware

If the OTOSuite software version contains a more recent firmware for the device, a message will appear when next you switch on the device.

It is recommended that you update the device firmware to make sure that the device and OTOSuite perform correctly.

- Follow the on-screen instructions.

13 Maintenance and calibration

MADSEN Itera II requires no preventive maintenance except for regular calibration of the transducers.

See [Calibration](#) ► 102.

13.1 Service and repair

It is recommended that you keep the packing material in which MADSEN 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.

Warning • For the sake of safety and in order not to void the warranty, service and repair of electro-medical equipment should be carried out only by the equipment manufacturer or by service personnel at authorized workshops. In case of any defects, make a detailed description of the defect(s) and contact your supplier. Do not use a defective device.

Note • There are no user-serviceable parts inside the MADSEN Itera II cabinet.

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.

13.1.1 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 T 1 A H/250 V, 5 mm x 20 mm.

13.2 Cleaning

Cleaning the device

There are no specific requirements to sterilization or disinfection of the test device.

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

- Remove dust using a soft brush.
- To clean the cabinet, use a soft, slightly damp cloth with a small amount of mild detergent on it.

Caution • 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.

Headphones

The headphones are in constant contact with the patient, and should therefore be kept clean.

Clean the headphones between patients, e.g. with a non-alcohol based antibacterial wipe, such as Audiowipes.

Eartips for Insert Earphones

Warning • To prevent cross-infection, use new eartips when you test the next client.

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

Bone oscillator

Clean the bone oscillator between patients, e.g. with a non-alcohol based antibacterial wipe, such as Audiowipes.

13.3 Calibration

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

Annual calibration

The audiometer, headphones, bone oscillators, and sound field speakers must be calibrated once a year by your authorized service department.

The audiometer 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 HL and dB masking level using the stated reference equivalent thresholds; dB HL is related to sound pressure levels, dB SPL = dB re 20 μ Pa, and force levels (dB re 1 μ N).

Caution • Note that calibration has been performed only on the transducers supplied! If you wish to use any other transducer for testing with the device, please contact your local distributor first.

14 Unpacking and installing

To install and get started with MADSEN Itera II and the OTOSuite Audiometry Module, follow the sequence below:

- Install OTOSuite on the PC before you connect to MADSEN Itera II from the PC.
- Unpack MADSEN Itera II (see [Unpacking ► 103](#)).
- Install MADSEN Itera II (see [Installation ► 103](#)).
- Run the OTOSuite Configuration Wizard to connect to and set up communication with MADSEN Itera II. (See [Configuring the Audiometry Module ► 99](#)).

14.1 Unpacking

Unpack the device carefully.

When you unpack the device and accessories, it is a good idea to keep the packing material in which they were delivered. If you need to send the device in for service, the original packing material will protect against damage during transport, etc. Visually inspect the equipment for possible damage.

If damage has occurred, do not put the device into operation. Contact your local distributor for assistance. Check with the packing list to make sure that you have received all necessary parts and accessories. If your package is incomplete, contact your local distributor.

1. Check the Test Report (Calibration Certificate), make sure that the transducers (headphones, and bone oscillators) are the correct ones, and that they comply with the ordered calibration standards.

14.2 Installation

This section provides you with instructions on how to assemble and install MADSEN Itera II.

Note • *Install OTOSuite on the PC before you connect to MADSEN Itera II from the PC.*

- Before you start using MADSEN Itera II, it is recommended that you leave it at room temperature for 30 minutes - particularly if it has been stored at very cold or warm temperatures, e.g. if it has been in a car.
- Read the user documentation before you connect or use MADSEN Itera II for the first time.

Safety aspects

To ensure safe performance, MADSEN Itera II must be correctly installed and the requirements listed in [Standards and safety ► 113](#) and [MADSEN Itera II ► 117](#) must be complied with.

Cooling requirements

There are no specific cooling requirements.

Caution • *Do not place anything on top of MADSEN Itera II.*

Caution • *Make sure that MADSEN Itera II is placed in a well ventilated location.*

- Place MADSEN Itera II in locations away from sources of heat and direct sunlight.
- MADSEN Itera II must not come into contact with liquids.

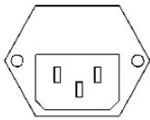
Connections

- 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 [Air conduction ▶ 104](#), [Bone conduction ▶ 105](#), [External microphone ▶ 105](#) and the locations described in [Socket connections - rear panel ▶ 26](#).
- The headphone (AC transducer) and SP (SF) transducer connectors and the CD/Tape sockets are color coded as described in [Socket connections - rear panel ▶ 26](#).

Installation sequence

1. Install OTOSuite on your PC.
2. Assemble and set up MADSEN Itera II.
 - [Powering ▶ 104](#)
 - [Connecting to a PC ▶ 104](#)
3. Switch on MADSEN Itera II.
4. Run the Configuration Wizard in OTOSuite to connect to and set up communication with MADSEN Itera II. See [Configuring the Audiometry Module ▶ 99](#).

14.2.1 Powering



1. Plug the power cord into the power socket of MADSEN Itera II.
See [Socket connections - rear panel ▶ 26](#).
2. Plug the other end of the power cord directly into an AC mains power outlet with a three-wire protective ground.

14.2.2 Connecting to a PC

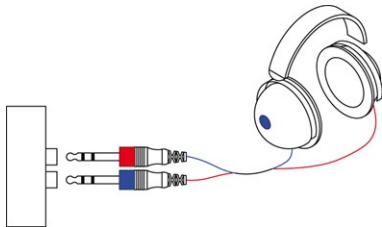
1. You can connect MADSEN Itera II to a PC by using an RS 232 cable.
See [RS232 interface sockets ▶ 107](#).
2. If required, use a USB converter for your RS232 cable. See your accessories list to order.

14.2.3 Air conduction

See [Socket connections - rear panel ▶ 26](#)

Headphones

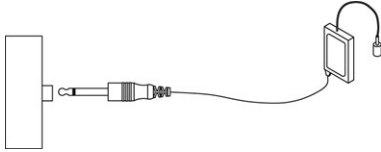
- Connect the right and left cables (red and blue) from the transducers to the right and left AC sockets in the rear panel of MADSEN Itera II.



Insert phones

- Connect the Insert phones to the right and left AC socket in the rear panel of MADSEN Itera II.

They must be connected according to calibration.



Alternatively, connect them to the right and left SF socket.

- To verify the calibration, press [AC]/[SF] and the display will show the transducer calibrated for that output.

14.2.4 Bone conduction

See [Socket connections - rear panel](#) ► 26.

- Connect the bone conduction transducer plug into the BC socket located in the rear panel of MADSEN Itera II.



14.2.5 External microphone

See [Socket connections - rear panel](#) ► 26.

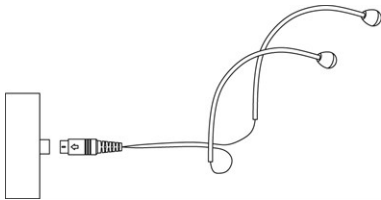
In speech testing and patient communication there are two possible external microphone solutions:

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

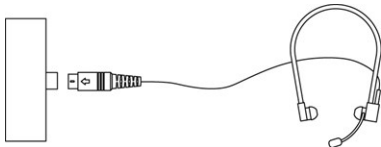
Connect the chosen microphone solution to the “EXTERNAL MIC/MONITOR HEADSET” socket.

Connecting one of these disables the internal talk-over microphone.

Gooseneck



Monitor headset with boom microphone

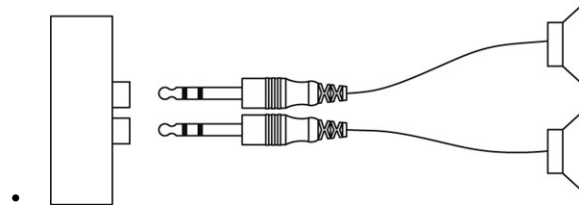


14.2.6 Free Field

See [Socket connections - rear panel](#) ► 26.

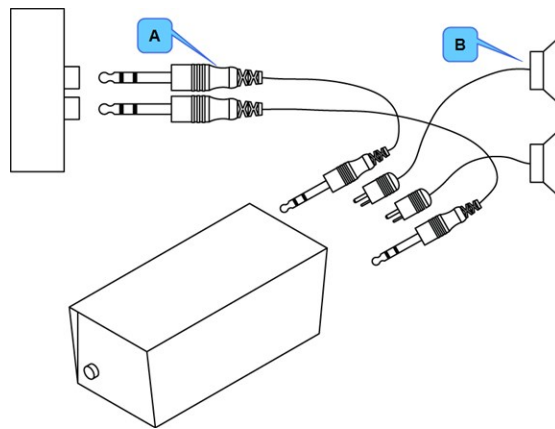
Without Power Amplifier

- Plug the Free Field transducer cables directly into the R-SF and L-SF sockets located in the rear panel of MADSEN Itera II. The sound is then routed out through sound field speakers.



With Power Amplifier

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



A. Free Field cables B. Power Amplifier cables

15 Maximum non-destructive voltage

App. 0.1 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 responder 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. 0.2 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.

16 Maximum output levels

16.1 Tone

Frequency	TDH39	Bone conductor (B-71)	Insert phone (E-A-RTONE® 3A)	HDA 200	HolmCo
125	80		105	100	85
250	100	45	110	110	100
500	120	65	120	120	115
750	120	65	120	120	120
1000	120	75	120	120	120
1500	120	80	120	120	120
2000	120	80	120	120	120
3000	120	80	120	120	115
4000	120	75	120	120	115
6000	110	50	110	110	110
8000	100	45	100	105	110
9000	n/a			100	
10000	n/a			90	
11200	n/a			85	
12500	75			80	
14000				60	
16000				50	

n/a: data not available

16.2 NBN

Frequency	TDH39	Bone conductor (B-71)	Insert phone (E-A-RTONE® 3A)	HDA 200	HolmCo
125	65		95	80	50
250	95	n/a	105	90	100
500	115	n/a	110	100	110
750	115	n/a	110	100	115
1000	115	n/a	115	100	115
1500	115	n/a	115	95	115

16 Maximum output levels

Frequency	TDH39	Bone conductor (B-71)	Insert phone (E-A-RTONE® 3A)	HDA 200	HolmCo
2000	110	n/a	115	95	100
3000	110	n/a	115	95	100
4000	110	n/a	110	95	100
6000	110	n/a	100	95	100
8000	105	n/a	100	95	105
9000	n/a			90	
10000	n/a			85	
11200	n/a			85	
12500	70			70	
14000				60	
16000				40	

n/a: data not available

17 Abbreviations

ABLB	alternate binaural loudness balance
AC	air conduction
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

17 Abbreviations












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

18 Standards and safety

This manual contains information and warnings, which must be followed to ensure the safe performance of the devices and software covered by this manual. Local government rules and regulations, if applicable, should also be followed at all times.

See [Symbols used ▶ 113](#) and [Warning notes ▶ 114](#).

18.1 Symbols used

	<p>Electronic equipment covered by the Directive 2002/96/EC on waste electrical and electronic equipment (WEEE).</p> <p>All electrical and electronic products, batteries, and accumulators must be taken to separate collection at the end of their working life. This requirement applies in the European Union. Do not dispose of these products as unsorted municipal waste.</p> <p>You can return your device and accessories to Otometrics, or to any Otometrics supplier. You can also contact your local authorities for advice on disposal.</p>
	Consult user manual for warnings and cautions.
	Consult user manual for warnings and cautions.
	Consult instructions for use.
	Complies with Type B requirements of IEC60601-1.
	Complies with Medical Devices Directive 93/42/EEC and RoHS Directive (2011/65/EC).
	MEDICAL - General Medical Equipment as to electrical shock, fire and mechanical hazards only in accordance with ANSI/AAMI ES60601-1 (2005) + AMD 1 (2012), IEC 60601-1-6, CAN/CSA-C22.2 No. 60601-1 (2014) and CAN/CSA-C22.2 No. 60601-1-6 (2011).
	Suitable for alternating current only.
	Power ON.
	Power OFF.
	Do not reuse.

18.2 Warning notes

1. This class of equipment is allowed in domestic establishments when used under the jurisdiction of a health care professional.
2. Do not use the instrument in the presence of flammable agents (gases) or in an oxygen-rich environment.
3. No parts may be eaten, burnt, or in any way used for purposes other than the applications defined in the Intended Use section of this manual.
4. The device and any device to be connected which has its own power supply should be turned off before any connections are established.
5. For safety reasons and due to effects on EMC, accessories connected to the equipment's outlet fittings must be identical to the type supplied with the system.
6. It is recommended that an annual calibration be performed on accessories containing transducers. Furthermore, it is recommended that calibration be performed if the equipment has suffered any potential damage (e.g. headphones 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 the device, please contact your local distributor first.

7. Unwanted noise may occur if the device is exposed to a strong radio field. Such noise may interfere with the performance of the device. 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 be restricted.



8. The bone conductor cable and insert phone cable must not be removed or tampered with while MADSEN Itera II is powered on. Either disconnect the bone conductor or insert phone entirely from the instrument, or make sure that the instrument itself is disconnected from the power source.



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



10. When selecting accessories connected to the RS232 socket and DC output of the device, the following points must be considered:
 - Use of connected equipment in a patient environment
 - Proof that connected equipment has been tested in accordance with Medical Electrical Systems in IEC 60601-1 3.1 edition: 2012, ANSI/AAMI ES60601-1 (2005) + AMD 1 (2012) and CAN/CSA-C22.2 No. 60601-1 (2014).
 - Do not touch the connectors of the device or connected devices and the patient at the same time.





11. Grounding continuity should be checked periodically.

12. Avoid using extension cables. The increased length of the cable may increase the resistance of the protective earth conductor beyond an acceptable level.
13. Operating at the wrong voltage may blow the fuses. For continued protection against fire hazard, replace fuses with the same type and rating only.
14. To comply with Medical Electrical Systems in IEC 60601-1 3.1 edition:2012, computer and printer must be placed out of reach of the client, i.e. not closer than approx. 1.5 meters/5 ft.

15. If the patient microphone is located within the patient area, the microphone should be classified as type B.

18.3 The OTOsuite Audiometry Module

 XXXX	Complies with Medical Devices Directive 93/42/EEC and RoHS Directive (2011/65/EC).
	Used in error message dialogs if software program fails. See the detailed information in the dialog box.

18.4 Manufacturer

GN Otometrics A/S
 Hoerskaetten 9, 2630 Taastrup
 Denmark
 ☎ +45 45 75 55 55
 📠 +45 45 75 55 59
www.otometrics.com

18.4.1 Responsibility of the manufacturer

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

- All assembly operations, extensions, re-adjustments, modifications or repairs are carried out by the equipment manufacturer or personnel authorized by the manufacturer.
- The electrical installation to which the equipment is connected complies with EN/IEC requirements.
- 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.

19 Technical specifications

19.1 MADSEN Itera II

Type identification

MADSEN Itera II is type 1004 from GN Otometrics A/S.

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 %.

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
Wave form:	Triangular

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)

Narrowband noise

Bandwidth:	Approximately 0.44 octaves (verified to be within 1/3 and ½ octaves, as required by audiometer standards).
Calibration:	Effective masking according to IEC and ANSI standards.
Speech noise:	Fulfills IEC and ANSI requirements to speech noise.

White noise:

Bandwidth

Electrical bandwidth: 100-20000 Hz. Acoustic bandwidth is transducer dependent.

Spectrum

Measured in third-octave bands, the spectrum level increases by 3 dB/octave.

Calibration

Calibrated in dB SPL, according to IEC and ANSI audiometer standards. Alternatively, calibration according to local standards may be ordered from the manufacturer.

Total harmonic distortion

Air < 2.5 %

Bone < 5 %

Selectable transducers

AC:	TDH39, ME-70, and Otometrics insert phones
BC:	BC-1, B-71 (Mastoid / Forehead)
SF:	TDH39, ME-70, Otometrics insert phones, Free-Field amplifier/loudspeaker

Transducer options depend on how 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 \times RCA phone
Microphone:	0.002 to 0.02 Vrms, 2 \times 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 600 Ω .

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 pulsed 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 seconds, in steps of 0.25 seconds

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 \pm 0.5 N
B-71:	5.4 N \pm 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 (-40°F to + 158°F)
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 (50°F to +95°F)
Air humidity:	30% to 90%, non-condensing
Air pressure	860 hPa to 1060 hPa.

(Operation in temperatures exceeding -20°C (-4°F) or +60°C (140°F) may cause permanent damage.)

Warm-up time

< 10 min.

Disposal

MADSEN Itera II can be disposed of as normal electronic waste, according to WEEE and 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 - 120 V AC, 200 - 240 V AC, 50/60 Hz

Power consumption

< 60 VA

Fuses

T 1 A H/250 V

Standards

Audiometer:	EN60645-1, EN60645-2, EN60645-4, and ANSI S3.6
Patient Safety:	Complies with IEC 60601-1 3.1 edition:2012, Class I, Type B; IEC 60601-1-6:2010; IEC 62366:2007; CAN/CSA-C22.2 NO 60601-1:2014; ANSI/AAMI ES60601-1 (2005) + AMD 1 (2012)
EMC:	IEC 60601-1-2:2007

Miscellaneous

Internal power supply to CD player: 1.5 - 10 V, 0.5 V steps

Software-adjustable contrast/brightness on display and LEDs

Integral Talk Over microphone

Digital Aux: 5-pole DIN

19.2 Accessories

Standard accessories and optional accessories may vary from country to country - please consult your local distributor.

- TDH 39 headphones (Headband: HB-7, HB-8)
- ME-70 headphones
- Otometrics insert phones
- Bone oscillators: BC-1, B-71
- Sound field loudspeakers
- Monitor headphones with boom microphone
- Gooseneck talk-over microphones (one right and one left microphone) for speech audiometry and Hearing Instrument Simulation
- Talkback microphone
- Patient Responder(s)
- Mains cable
- Power supply cable from MADSEN Itera II to CD player
- PA 210 power amplifier for free-field testing
- Wall mount kit for amplifier
- Connection cables
- Audiogram pad
- MADSEN Itera II Reference Manual
- MADSEN Itera II User Guide


19.3 Notes on EMC (Electromagnetic Compatibility)

- MADSEN Itera II is part of a medical electrical system and is thus subject to special safety precautions. For this reason, the installation and operating instructions provided in this document should be followed closely.
- Portable and mobile high-frequency communication devices, such as mobile phones, may interfere with the functioning of MADSEN Itera II.

Guidance and manufacturer's declaration - electromagnetic emissions for all equipment and systems		
MADSEN Itera II is intended for use in the electromagnetic environment specified below. The user of MADSEN Itera II should ensure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	MADSEN Itera II uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	MADSEN Itera II is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
<p>Note: The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.</p>		

Guidance and manufacturer's declaration - electromagnetic immunity for all equipment and systems			
MADSEN Itera II is intended for use in the electromagnetic environment specified below. The user of MADSEN Itera II should ensure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	+/- 6 kV contact +/- 8 kV air	+/- 6 kV contact +/- 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
U _T is the AC mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration - electromagnetic immunity - for equipment and systems that are NOT life-supporting
MADSEN Itera II is intended for use in the electromagnetic environment specified below. The user of MADSEN Itera II should ensure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Radiated RF IEC 61000-4-3	150 kHz to 80 MHz outside ISM bands ^a 3 V/m 80 MHz to 2.5 GHz	3 V/m	Portable and mobile RF communications equipment should be used no closer to any part of MADSEN Itera II, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance: $d = 1.2 \sqrt{P}$ $d = 1.2 \sqrt{P}$ for 80 MHz to 800 MHz $d = 2.3 \sqrt{P}$ for 80 MHz to 2.5 GHz, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, ^a should be less than the compliance level in each frequency range. ^b Interference may occur in the vicinity of equipment marked with this symbol: 

Note 1: At 80 MHz and 800 MHz the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

- a. The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40,70 MHz.
- b. The compliance levels in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2.5 GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in these frequency ranges.
- c. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which MADSEN Itera II is used exceeds the applicable RF compliance level above, the MADSEN Itera II should be observed to verify normal operation. If abnormal performance is observed, additional measures might be necessary, such as reorienting or relocating MADSEN Itera II.
- d. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communications equipment and MADSEN Itera II			
Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz outside ISM bands $d = 1.2 \sqrt{P}$	80 MHz to 800 MHz $d = 1.2 \sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3 \sqrt{P}$

19 Technical specifications

0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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