Instructions for Use – US

AC40

Clinical Audiometer

Interacoustics

Item No. 8100551 – 03/2015

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1 Introduction

1.1 About this Manual

This manual is valid for the AC40. These products are manufactured by:

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1.2 Intended Use

The AC40 audiometer is designed to be a device for diagnosing hearing loss. Output and specificity of this type of device are based on the test characteristics defined by the user, and may vary depending on environmental and operating conditions. The diagnosing of hearing loss using this kind of diagnostic audiometer depends on the interaction with the patient. However, for patients not responding well possibilities of various tests allow the tester to have at least some evaluative result. Thus, a “normal hearing” result should not allow for ignoring other contra indications in this case. A full audiologic evaluation should be administered if concerns about hearing sensitivity persist.

The AC40 audiometer is intended to be used by an audiologist, hearing healthcare professional or trained technician in an extremely quiet environment according to the ISO standard 8253-1. This instrument is intended for all patient groups regarding sex, age and health provided that the patient is able to respond to the signals in a rational way.Careful handling of the instrument whenever in contact with a patient should be of high priority. Calm and stable positioning while testing is preferred for optimal accuracy.

1.3 Product Description

The AC40 is a full 2 channel clinical audiometer offering air, bone, speech and built in free field amplier. It offers a wide range of clinical test features such as high frequency, multi frequency, weber, SISI, etc.

Included Parts

AC40
Goose neck 1059 microphone
DD45 Audiometric headset
B71 bone conductor headset
2 x APS3 Patient response switch
HDA300 Phone headset for HF
Cleaning cloth
Power cable
Instructions for Use AC40
Monitor Headset with boom

Optional Parts

TDH39AA with Amplivox Headset
DD45 with Peltor Headset
Eartone 5A 10 Ohm
Eartone 3A 10 Ohm
IP30 insert phone 10 Ohm
CIR33 insert earphone kit for masking or monitoring
Amplivox audiocups, noise reducing headset
Talk back microphone
Sound field speakers SP90 (with external power amp)
AP12 Power Amplifier 2x12 Watt
AP70 Power Amplifier 2x70 Watt
Cable USB 2m
Diagnostic Suite
OtoAccess™ database

1.4 Warnings

Throughout this manual the following meaning of warnings, cautions and notices are used:

	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	NOTICE is used to address practices not related to personal injury.

2 Unpacking and Installation

2.1 Unpacking and Inspection

Check box and contents for damage

When the instrument is received please check the shipping box for rough handling and damage. If the box is damaged it should be kept until the contents of the shipment have been checked mechanically and electrically. If the instrument is faulty please contact your local distributor. Keep the shipping material for the carrier's inspection and insurance claim.

Keep carton for future shipment

The AC40 comes in its own shipping carton, which is specially designed for the AC40. Please keep this carton. It will be needed if the instrument has to be returned for service.
If service is required please contact your local distributor.

Reporting Imperfections

Inspect before connection

Prior to connecting the product it should once more be inspected for damage. All of the cabinet and the accessories should be checked visually for scratches and missing parts.

Report immediately any faults

Any missing part or malfunction should be reported immediately to the supplier of the instrument together with the invoice, serial number, and a detailed report of the problem. In the back of this manual you will find a "Return Report" where you can describe the problem.

Please use "Return Report"

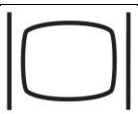
Please realise that if the service engineer does not know what problem to look for he may not find it, so using the Return Report will be of great help to us and is your best guarantee that the correction of the problem will be to your satisfaction.

Storage

If you need to store the AC40 for a period, please ensure it is stored uder the conditions specified in the section for technical specifications:

2.2 Marking

The following marking can be found on the instrument:

Symbol	Explanation
	Type B applied parts. Patient applied parts that are not conductive and can be immediately released from the patient.
	Refer to instruction manual
	WEEE (EU-directive) This symbol indicates that when the end-user wishes to discard this product, it must be sent to separate collection facilities for recovery and recycling.
 0123	The CE-mark indicates that Interacoustics A/S meets the requirements of Annex II of the Medical Device Directive 93/42/EEC. TÜV Product Service, Identification No. 0123, has approved the quality system.
	Year of manufacture
	Do not re-use Parts like ear-tips and similar are for single use only
	Display Port Connection – HDMI type

2.3 General Warnings and Precautions

External equipment intended for connection to signal input, signal output or other connectors shall comply with relevant IEC standard (e.g. IEC 60950 for IT equipment). In these situations an optical isolator is recommended to fulfill the requirements. Equipment not complying with IEC 60601-1 shall be kept outside the patient environment, as defined in the standard (usually 1.5 meter). If in doubt, contact qualified medical technician or your local representative.

This instrument does not incorporate any separation devices at connections for PCs, printers, active speakers etc. (Medical Electrical System).

When the instrument is connected to a PC and other items of equipment of a medical electrical system assure that the total leakage current cannot exceed the safety limits and that separations have the dielectric strength, creepage clearances and air clearances required fulfilling the requirements of IEC/ES 60601-1. When the instrument is connected to a PC and other similar items be aware of not touching the PC and patient simultaneously

To avoid the risk of electric shock, this equipment must only be connected to supply mains with protective earth.Do not use any additional multiple socket-outlet or extension cord.

This instrument contains a coin-type lithium battery. The cell can only be changed by service personnel. Batteries may explode or cause burns, if disassembled, crushed or exposed to fire or high temperatures. Do not short-circuit.

No modification of this equipment is allowed without Interacoustics authorization.

Interacoustics will make available on request circuit diagrams, component part lists, descriptions, calibration instructions, or other information that will assist service personnel to repair those parts of this audiometer that are designated by the Interacoustics as repairable by service personnel

⚠CAUTION

Never insert or in any way use the insert headset without a new clean non defect test tip. Always make sure that foam or ear-tip is mounted correctly. Ear tips and foam are single use.

The instrument is not intended to be used in environments exposed to fluid spills.

It is recommended that the disposable foam ear tips supplied with the optional insert transducers are replaced after testing each patient. Disposable plugs also ensure that sanitary conditions exist for each of your patients, and that periodic cleaning of a headband or cushion is no longer required.

- The black tubing protruding the foam ear tip is attached to the sound tube nipple of the insert transducer.
- Roll the foam tip into the smallest possible diameter.
- Insert into the ear canal of the patient.
- Hold the foam tip until expanded and a seal is achieved.
- After testing the patient the foam tip including the black tubing is detached from the sound tube nipple.
- The insert transducer should be examined prior to attaching a new foam tip.

The instrument is not intended to be used in oxygen rich environments or use in conjunction with flammable agents.

To ensure correct cooling of the device, please ensure free air flow on all sides of the instrument. Make sure that cooling ribbons are not covered. It is recommended to place the instrument on a hard surface.

NOTICE

To prevent system faults take appropriate precautions to avoid PC viruses and similar.

Use only transducers calibrated with actual instrument. To identify a valid calibration, the serial number for the instrument will be marked on the transducer.

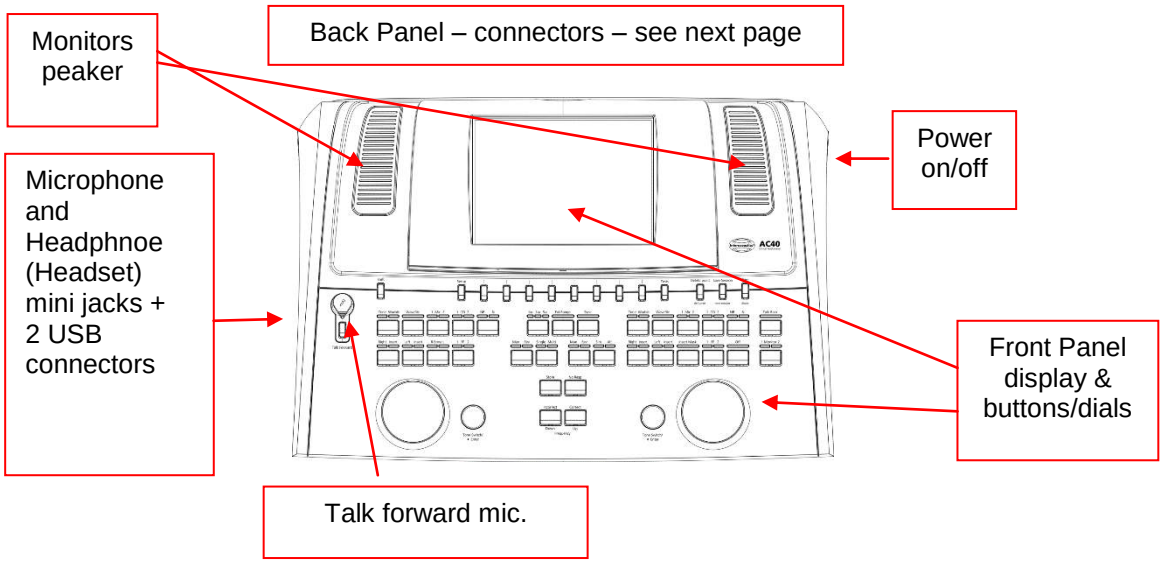
Although the instrument fulfils the relevant EMC requirements precautions should be taken to avoid unnecessary exposure to electromagnetic fields, e.g. from mobile phones etc. If the device is used adjacent to other equipment it must be observed that no mutual disturbance appears.Please also refer to EMC concideration in the appendix.

Within the European Union it is illegal to dispose electric and electronic waste as unsorted municipal waste. Electric and electronic waste may contain hazardous substances and therefore has to be collected separately. Such products will be marked with the crossed-out wheeled bin shown below. The cooperation of the user is important in order to ensure a high level of reuse and recycling of electric and electronic waste. Failing to recycle such waste products in an appropriate way may endanger the environment and consequently the health of human beings.

To prevent system faults take appropriate precautions to avoid PC viruses and similar.

3 Getting Started - Setup and Installation

The following shows an overview of the AC40:

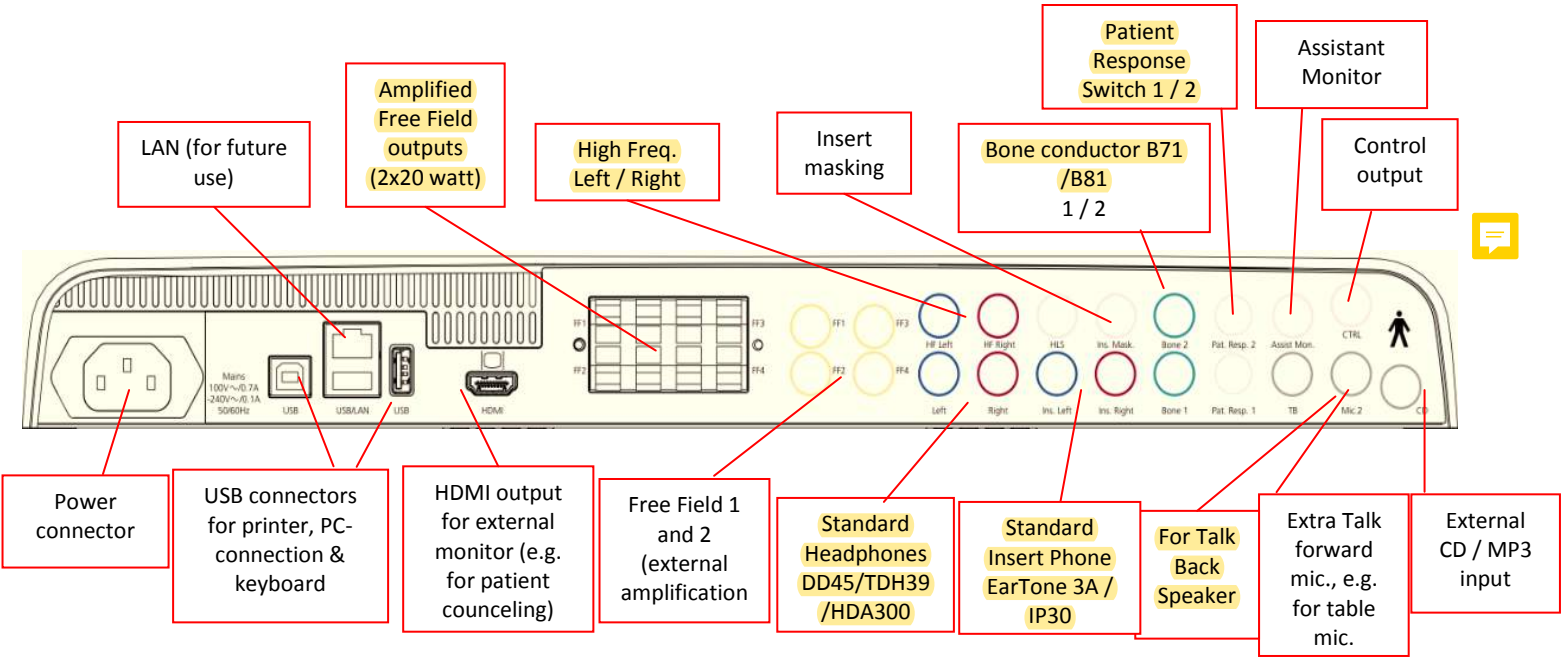


The top left part of the AC40 (display holder) contains the two monitor speakers.
The left side of the instrument contains two mini jack connectors for a microphone and a headphone – or a headset. This is used for talkback headphone/speaker (TB) and talk forward microphone (TF). Next to that two USB connectors are located. These can be used for connecting external printers/keybaords and USB sticks for installing firmware/wave file material.
A swan neck microphone can be plugged into the top part of the instrument by top part of Talk Forward button. This can be used for talk forward. When not in the swan neck microphone can be placed underneath the display. Please refer to the section about patient communication for more.
The upper right side of the instrument holds the on/off switch of the instrument.

Make sure that the audiometer is placed so that the patient cannot see/hear the clinician's use of the instrument.

3.1 Back Panel External Connections – Standard Accessories

The back panel contains all the rest of the main connectors (sockets):



Special notes:

- The HLS (hearing loss simulator) connector is currently not used. Use the Standard Headphone and HF Headphone connectors for HLS. This is prepared for future use.
- In addition to the standard DD45 headset, four other air conduction transducers may be used (they all connect to specific outputs on the AC40):
  - HDA300: High Frequency requires a HF headset.
  - CIR33 for insert masking: Insert phone CIR33 for insert masking has a limited sound quality, making it only adequate for masking noise presentation.
  - EAR-Tone 3A or 5A general purpose insert phone: Insert headphone EAR-Tone 3A or 5A are high quality transducers that may be used instead of the DD45/TDH39. It improves cross hearing from the normal approximately 40dB of the TDH39 to approximately 70dB. Masking as well as avoiding over-masking is thus easier with this type of headphone.
  - IP30 insert phone is the standard insert phone with same properties as EAR-Tone 3A
- Currently FF3/FF4 (both the powered and non-powered) is not used. This is prepared for future use.
- Assistant Monitor: There is always a direct connection through the goose neck microphone to the assistant wearing a headset connected to the “Assistant Monitor” output.
- The LAN connection is currently not used for any application (only internally in production).
- Mic 2: Please refer to the section about Patient Communication (Talk Forward and Talk Back).
- When using the HDMI output the output resolution will be the saved as on the build in 8,4 inch display: 800x600.
- CD-input: It is required that any attached CD-player has a linear frequency response in order to comply with the requirements of IEC 60645-2.
- USB connections is used for:
  - PC connection to Diagnostic Suite (the large USB connector)
  - Direct print
  - PC-keyboard (for entering client names)

3.2 PC-Interface

Please refer to the Diagnostic Suite operation manual regarding hybrid mode (on-line and PC-operated mode) as well as patient/session data transfer.

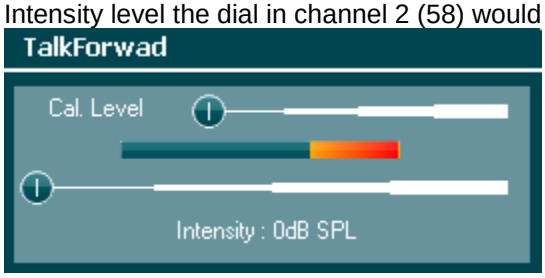
3.3 Patient Communication and Monitoring

3.3.1 Talk Forward

Talk Forward is activated by the “Talk Forward” button (24). AC40 contains three microphone connectors which will work in the following priority (depending on which one(s) is connected):

- Priority 1: The mini jack in the left side of the instrument – can be used with a headset together with the headphone connector. This has the first priority.
- Priority 2: The swan neck microphone (1) of the AC40 is located above the “Talk Forward” (24) button. If no mic. is connected to the priority 1 mic., this with be used.

The image below will be shown while the talk forward is active (by hold the button down) where the calibration (gain) level and intensity level for patient communication can be adjusted. To change the calibration level the clinician would adjust the HL dB dial (57) to the appropriate level. To adjust the Intensity level the dial in channel 2 (58) would be used.



3.3.2 Talk Back

The operator may use Talk Back (38) in one of the following ways:

- If no headphone is connected to the Talk Back (left side connector), the voice is wired through the Talk Back speakers next to the display (2)(3).
- If a headphone/headset is connected to the instrument, talk back will come through this instead.

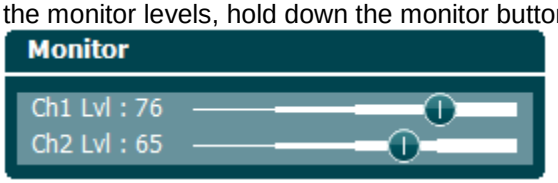
To adjust the TB level, hold down the TB button and use left/right totary wheels to adjust the level.

3.3.3 Assistant Monitor

There is always a direct connection through the goose neck microphone to the assistant wearing a headset connected to the “Assistant Monitor” output.

3.3.4 Monitoring

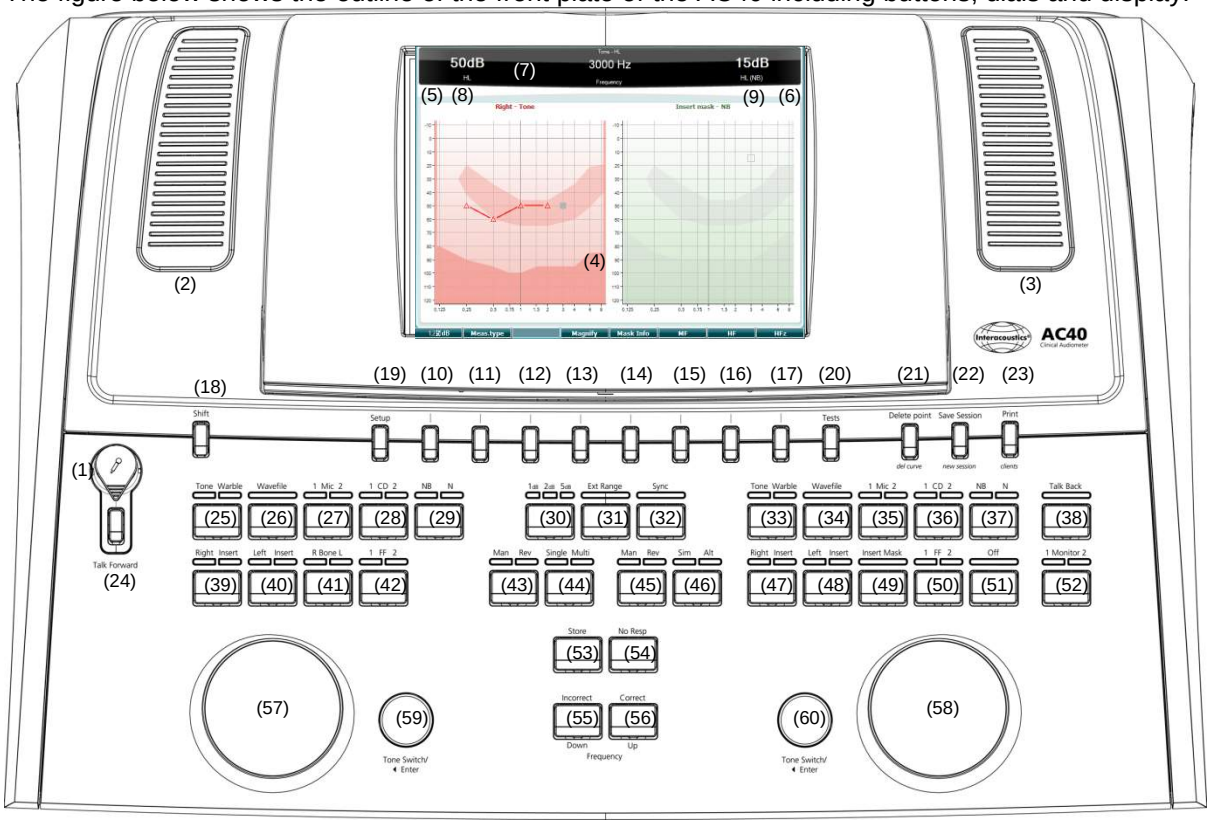
Monitoring of channel 1, 2 or both channels together is available by selecting the “Monitor” button (52) once, twice or three times. Selecting it a fourth time will switch off the monitoring function again. To adjust the monitor levels, hold down the monitor button and use left/right totary wheels to adjust the level.



Selecting desired way of listening:
The monitor signal will be available through the monitor headset if connected, the internal monitor speaker, or through the power monitor output driving an external speaker.

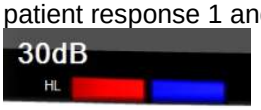
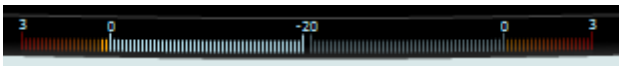
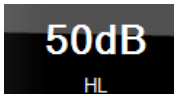
3.4 Operating instructions

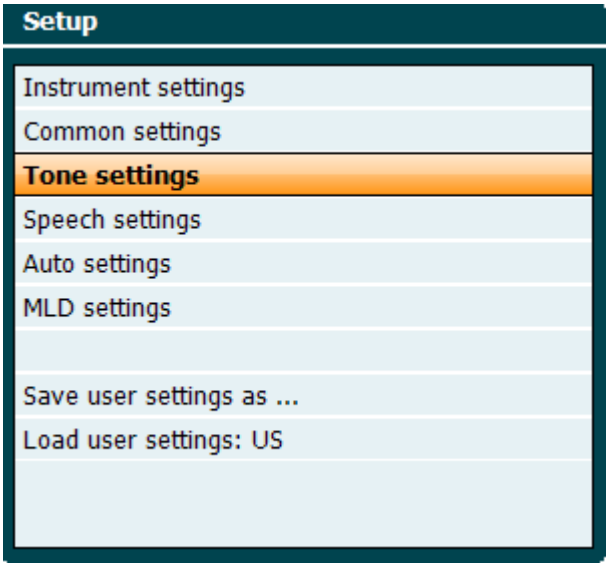
The figure below shows the outline of the front plate of the AC40 including buttons, dials and display:



The following table describes the functions of the various buttons and dials.

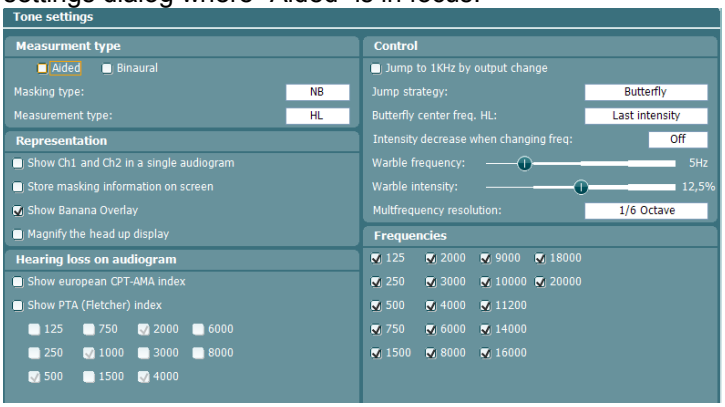
	Name(s)/Function(s)	Description
1	Microphone	For live voice speech and talk forward instruction to the patient in the test cabin. Can be deattached and stored in the compartment under the display.
2	Talk back / Monitor Speaker	For speech feedback from the patient in the test cabin. To adjust the TB / monitor levels, hold down the TB / monitor button and use left/right totary wheels to adjust the level.
3	Talk back / Monitor Speaker	For speech feedback from the patient in the test cabin. To adjust the TB / monitor level, hold down the monitor button and use left/right totary wheels to adjust the level.
4	Color Display Screen	For displaying the different test screens. Will be further explained in the sections describing the individual tests.
5	Tone Indicator Channel 1	Indication light is seen when a tone stimuli is presented to the patient on channel 1 (“Stim”).
6	Tone Indicator Channel 2	Indication light is seen when a tone stimuli is presented to the patient on channel 2 (“Stim”).

7	Response Indicator / VU meter	Indication light is seen when the patient activates the patient signal using the patient response. A red indicator is used for patient response 1 and a blue is used for patient response 2:  VU meter indicator:  Hold in the Mic (27) and CD (28) button in to adjust the live voice or CD input level using the left and right rotary wheels. Adjust the levels for the until you reach an average of approximately 0 dB VU on the VU meter.
8	Channel 1	Indicates intensity level for channel 1, e.g.: 
9	Channel 2 / Masking	Indicates intensity level or masking level for channel 2, e.g.:
10-17	Function Keys	These keys are context sensitive and depend on the selected test screen. The fuctions of these keys will be explained further in later sections.
18	Shift	The shift function will enable the clinician to activate the sub functions written in *italic* underneath the buttons. It can also be used for the following important operations: • To activate binaural two channel tone/speech testing – e.g. route Tone/Speeh in both Right and Left channels binaurally. In this case both the Right and Left buttons lights will be on. • When running wave file in manual mode, it can be used to select which word to play, i.e. by holding down shift in combination with the left rotary wheel (57). Use the tone switch (59) to play the selected word before scoring it. • To activate Uninstall under Common settings.
19	Setup	Allows the clinician to make changes in certain settings within each test and to change the common settings for the instrument. A single push will by default enter the selected Test Settings menu. To enter other settings menus, hold the “Setup” button and use on of the rotary wheels (57)/(58) to select:



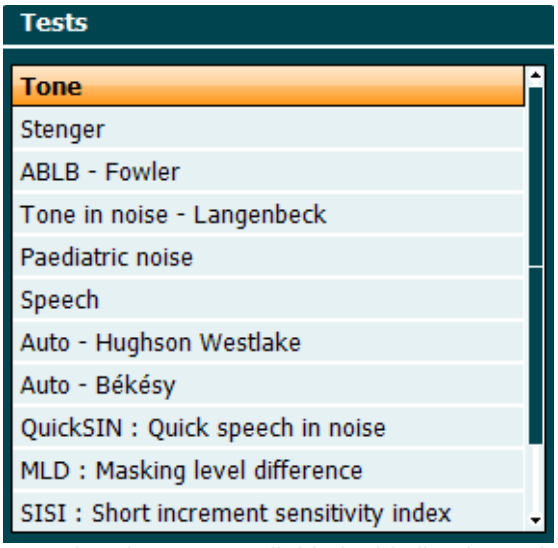
To save the settings use “Save all settings as...”.
To use another user setting (protocol/profile) use “Load user settings: ....”.

Inside a settings menu, choose between the different settings using the right rotary wheel (58). Change the individual settings using the left rotary wheel (57). Here is an example from the Tone settings dialog where “Aided” is in focus:



20 Tests

Allows the clinician to access special tests. Hold down the “Tests” button and use one of the rotary wheels (57)/(58) to select the individual tests.



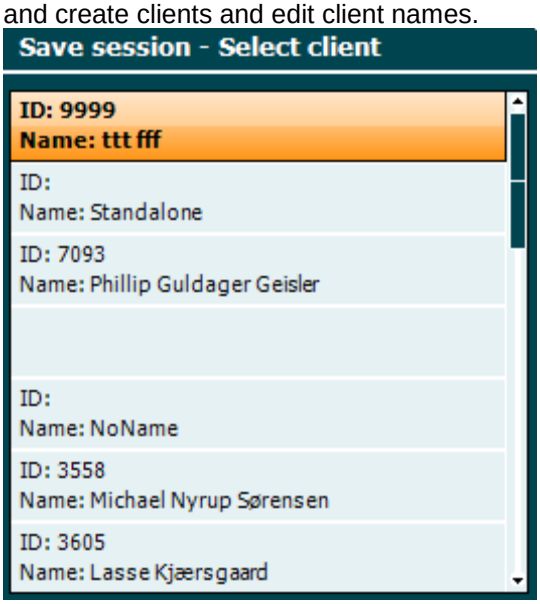
Note that the tests available in this list depends on the test licenses installed on the instrument. This may also vary from country to country.

21 Del Point / del curve

Delete points during testing by selecting a point using the “Down” (55) and “Up” (56) buttons and pressing the “Delete Point” button. Delete the entire test curve of a graph by holding “Shift” (18) and pressing the “Del Point” button.

22 Save Session/ *New Session*

Save a session after testing or alternatively create a new session by holding “Shift” (18) and pressing the “Save Session” button. In the Save Session menu it is possible to save sessions, delete and create clients and edit client names.



The maximum capacity is 1000 clients. Please see section below for a screenshot of the Save Session dialogue.

23 Print *Clients*

Allows results to be printed directly after testing (via a supported USB printer – please contact Interacoustics customer service for a list of supported PC printers if in doubt). The printout logo can be configured via the Diagnostic Suite (in the General Setup a logo image can be downloaded to the instrument from the PC). Please refer to the Diagnostic Suite manual.

		Hold ”Shift” (18) and press “Print” to access the clients and sessions stored on the device.
24	Talk Forward	Instruction to the patient directly through his headphones via the microphone (1) can be given. Change the gain by turning the left rotary wheel (57) while holding the “Talk Forward” button. Change the intensity by turning the right rotary wheel (58) while holding the “Talk Forward” button. Please read more about Talk Forward/Talk Back in later section about “Patient Communication”.
25	Tone/Warble Channel 1	Pure tones or warble tones can be chosen as stimuli on channel 1 by activating this button once or twice. The stimuli chosen will be shown on the display, e.g.: The (optional) Pediactric Noise stimuli can be acticated from the Test (20) menu. When this stimulusi is selected the Warble light indicater will blink in a slow interval.
26	Wavefile Channel 1	Enables one to perform speech testing on channel 1 using loaded wave files, i.e. pre-recorded speech material. Requires installation of speech material.
27	1 Mic 2 Channel 1	For live speech testing through the microphone (1) (or alternatively Mic 2 if connected) on channel 1. The VU meter can be seen on the display screen. Adjust the microphone gain by holding down the Mic button for one second and turning one of the rotary wheels (57)/(58) while holding the Mic button.
28	1 CD 2 Channel 1	By pressing this function once or twice it is possible to have recorded speech in either channel 1 or channel 2 separately. Adjust the gain of CD 1 and 2 by holding down the CD button for one second and turning one of the rotary wheels (57)/(58).
29	NB N Channel 1	Choose between Narrow Band Noise and Broad Band Noise on channel 1.
30	1 2 5	Choose between 1, 2 and 5 dB intervals when adjusting the intensity levels in channel 1 and 2 or adjusting the masking level when masking is used.
31	Ext Range	Extended Range: Usually the maximum output is e.g. 100 dB but if a higher output e.g. 120 dB is needed then “Ext Range” can be activated when reaching a certain level.
32	Sync	This allows the masking attenuator to the tone attenuator to be activated. This option is used for e.g. synchronous masking.
33	Tone / Warble Channel 2	Pure tones or warble tones can be chosen as stimuli on channel 2 by activating this button once or twice. The stimulus chosen will be shown on the display, e.g.:

34	Wavefile Channel 2	Enables one to perform speech testing on channel 2 using loaded wave files, i.e. pre-recorded speech material. Requires installation of speech material.
35	1 Mic 2 Channel 2	For live speech testing through the microphone (1) (or alternatively Mic 2 if connected) on channel 2. The VU meter can be seen on the display screen. Adjust the microphone gain by holding down the Mic button for one second and turning one of the rotary wheels (57)/(58) while holding the Mic button.
36	1 CD 2 Channel 2	By pressing this function once or twice it is possible to have recorded speech in either channel 1 or channel 2 separately. Adjust the gain of CD 1 and 2 by holding down the CD button for one second and turning one of the rotary wheels (57)/(58).
37	NB N Channel 2	Choose between Narrow Band Noise and Broad Band Noise on channel 2.
38	Talk Back	When active it allows the clinician to hear comments or responses from the patient through the AC40 or monitor headset. Adjust the gain by holding down the button for one second and turning one of the rotary wheels (57)/(58) while holding the Talk Back button.
39	Right / Insert Channel 1	For selecting the right ear on channel 1 during testing. Insert phones for the right ear can be activated by pressing twice (can only be selected when calibrated). To route the signal binaurally in Left and Right, use the shift button (18) and select the right ot left button (39) (40).
40	Left / Insert Channel 1	For selecting the left ear on channel 1 during testing. Insert phones for the left ear can be activated by pressing twice (can only be selected when calibrated). To route the signal binaurally in Left and Right, use the shift button (18) and select the right ot left button (39) (40).
41	R Bone L Channel 1	For bone conduction testing on channel 1 (can only be selected when calibrated). • First push: selects the right ear for testing. • Second push: selects the left ear for testing.
42	1 FF 2 Channel 1	Pressing “1 FF 2” will select free field speaker as output for channel 1 (can only be selected when calibrated). • First push: Free Field speaker 1 • Second push: Free Field speaker 2
43	Man / Rev Channel 1	Manual / Reverse tone presentation modes: • First push: Manual tone presentation on channel 1 each time “Tone Switch” for channel 1 (59) is activated. • Second push: The reverse function - continuous tone presentation on channel 1 which will be interrupted for as long as the“Tone Switch” for channel 1 (59) is activated.
44	Single / Multi Channel 1	Pulsing modes: • First push: the tone presented on channel 1 will have a pre-set length when “Tone Switch” for channel 1 (59) is activated. The pulse lengths can be set up in the “Setup” (18).

		• Second push: the tone on channel 1 will be pulsating continuously for as long as the tone switch is activated/pushed. • Third push: returns back to normal mode.
45	Man / Rev Channel 2	Manual / Reverse tone presentation modes: • First push: Manual tone presentation on channel 2 each time “Tone Switch” for channel 2 (60) is activated. • Second push: The reverse function - continuous tone presentation on channel 2 which will be interrupted each time “Tone Switch” for channel 2 (60) is activated.
46	Sim / Alt Channel 2	Allows toggling between Simultaneous and Alternate presentation. Ch1 and Ch2 will present the stimuli simultaneously when Sim is selected. When Alt is selected, the stimulus will alternate between Ch1 and Ch2.
47	Right / Insert Channel 2	For selecting the right ear on channel 2 during testing. Insert phones for the right ear can be activated by pressing twice (can only be selected when calibrated).
48	Left / Insert Channel 2	For selecting the left ear on channel 2 during testing. Insert phones for the left ear can be activated by pressing twice (can only be selected when calibrated).
49	Insert Mask Channel 2	Masking turned on on channel 2.
50	1 FF 2 Channel 2	Pressing “1 FF 2” will select free field speaker as output for Channel 2 (can only be selected when calibrated). • First push: Free Field speaker 1 • Second push: Free Field speaker 2
51	Off Channel 2	Turn channel 2 off.
52	1 Monitor 2	Allows you to monitor one or both channels.
53	Store	Use this function to store test thresholds / results. To store the whole audiogram session under a patient use “Save Session” (22).
54	No Resp	Use this function if the patient has shown no response to stimuli.
55	Down / Incorrect	Is used to decrease the frequency level. The AC40 has an incorporated automatic speech score counter. Therefore as a second function you can use this button as an “Incorrect” button when performing speech tests. For automatic speech score counting while testing speech push this button after each word not repeated correctly by the patient.
56	Up / Correct	Is used to increase the frequency level. The AC40 has an incorporated automatic speech score counter. Therefore as a second function you can use this button as a “Correct” button when performing speech tests. For automatic speech score counting while testing speech push this button after each word heard correctly by the patient.

57	HL dB Channel 1	This allows for the adjusting of the intensity in channel 1 shown at (8) in the display.
58	Masking Channel 2	Adjust the intensity level in channel 2 or masking levels when masking is used. Shown at (9) in the display.
59	Tone Switch / Enter Channel 1	Used for tone presentation where the “Tone” light for channel 1 (5) will show. Can also be used as “Enter” (selection) button when selecting settings, patient name characters etc.
60	Tone Switch / Enter Channel 2	Used for tone presentation where the “Tone” light for channel 2 (6) will show. Can also be used as “Enter” (selection) button when selecting settings, patient name characters etc.

3.5 Tests Screens and Function Key Descriptions

The following tests are available from the Test (20) button. Use rotary wheels (57)/(58) to select the individual test screen:

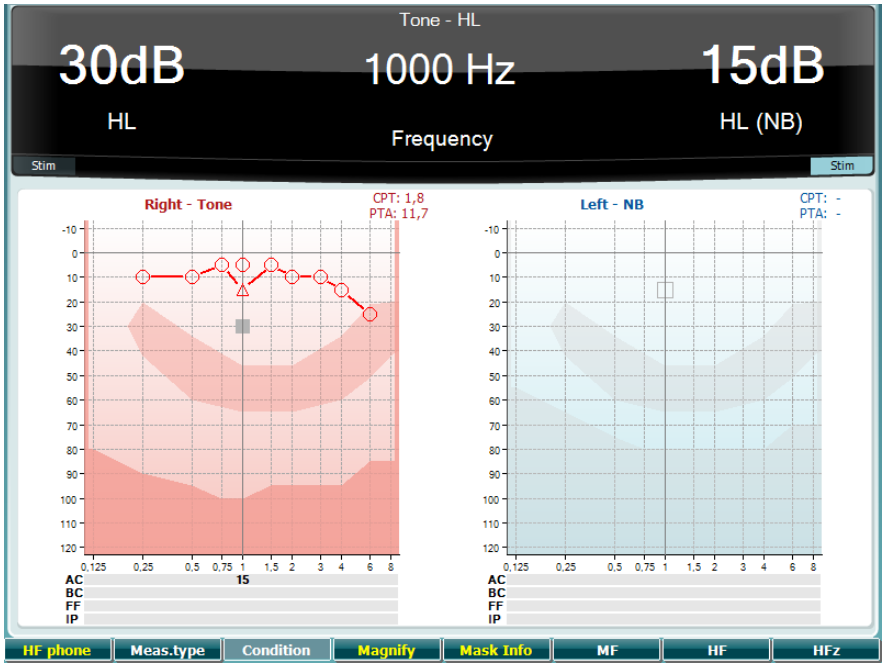
- Tone
- Stenger
- ABLB – Fowler
- Tone in noise – Langenbeck
- Pediatric Noise Stimuli
- Speech
- Auto – Hughson Westlake
- Auto – Békésy
- QuickSIN – Quick speech in noise
- MLD – Masking level difference
- SISI – Short increment sensitivity index
- MHA – Master Hearing Aid
- HLS – Hearing Loss Simulater

The (optional) Multi Frequency (MF) and HF (High Frequency) / HFz (High Frequency Zoom) test features are activated from the Tone Screen – i.e. as extentions to the Tone audiogram test screen.

Please note that the tests available in this list depend on the test licenses installed on the instrument. This may also vary from country to country.

3.5.1 Tone Test

The Tone test screen is used for pure/warble tone audiometry via normal head phones or insert phones, bone conduction, free field audiometry, multi frequency (optional test) as well as high frequency/high frequency zoom (optional). When using Bone conduction, masking must be applied to obtain correct results.



	Function Key	Description
10	HF phone	Only available if High Frequency is available (optional license) on the instrument. Selects the HF phone connected to the separate HF connectors.
11	Meas.type	Choose between HL, MCL and UCL by holding the Function Key (10) and select the required measuring type by using one of the rotary wheels (56)/(57).
12	Condition	Not used in this test screen.
13	Magnify	Switch between magnified top bar and normal sized top bar.
14	Mask Info	View the masking levels (dual audiogram mode only).
15	MF	Multi frequency (optional MF license)
16	HF	High Frequency (optional HF license)
17	HFz	High Frequency Zoom (optional HF license)

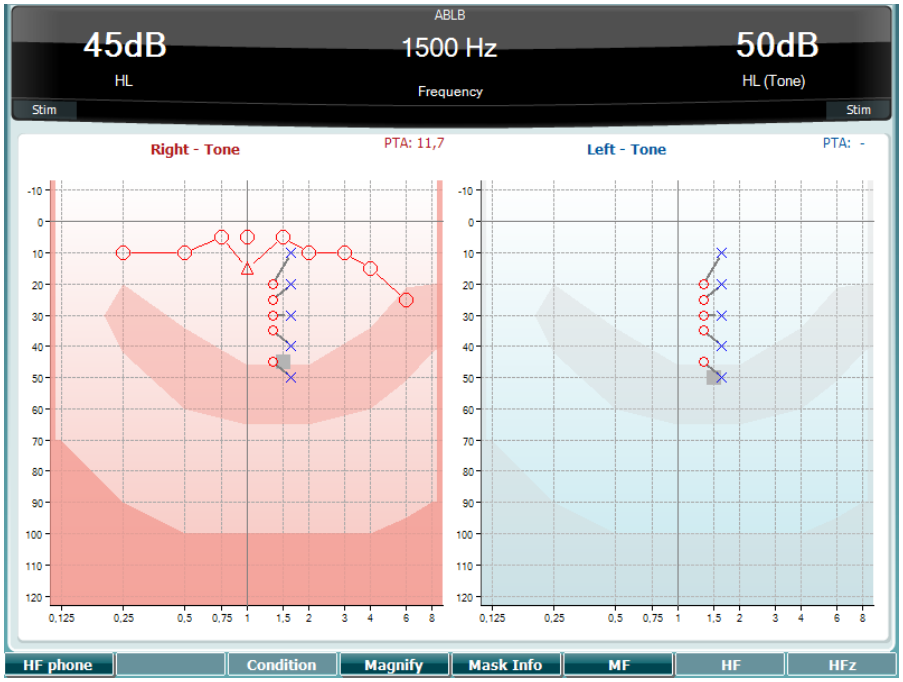
3.5.2 Stenger Test

The Stenger test is a test when a patient is suspected of feigning/faking a hearing loss and is based on the auditory phenomenon, “The Stenger Principle”, that states that only the louder of two similar tones presented to both ears at the same time will be perceived. As a general rule it has been recommended to perform the Stenger test in case of unilateral hearing losses or significant asymmetries.

Please refer to the Tone Test section above for key function descriptions for Function Keys (10), (13), (14), (15), (16), (17).

3.5.3 ABLB - Fowler Test

ABLB (Alternate Binaural Loudness Balancing) is a test to detect perceived loudness differences between the ears. The test is designed for people with unilateral hearing loss. It serves as a possible test for recruitment.
The test is performed at frequencies where recruitment is presumed. The same tone is presented alternatively to both ears. The intensity is fixed in the impaired ear (20 dB above pure tone threshold). The task of the patient is to adjust the level of the better ear until the signal in the two ears is of equal intensity. Note however that the test may also be performed by fixing the intensity in the normal hearing ear and having the patient set the tone for the impaired ear.



Please refer to the Tone Test section above for key function descriptions for Function Keys (10), (13), (14), (15), (16), (17).

3.5.4 Tone in Noise Test (Langenbeck Test)

Please refer to the Tone Test section above for key function descriptions for Function Keys (10), (13), (14), (15), (16), (17).

3.5.5 Pediatric Noise Stimuli

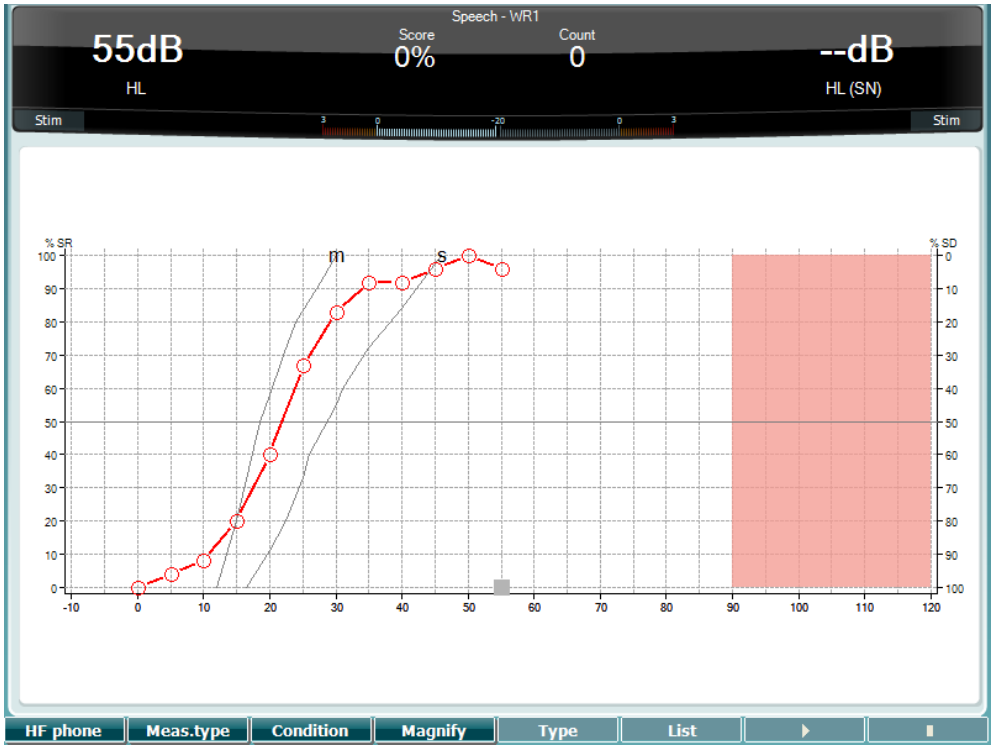
This Pediatric Noise stimuli is a narrow band noise signal that is designed with very steep filter slopes. Pediatric noise stimuli replaces the use of the narrow band masking noise as a stimulus for threshold assessment – in particular for pediatric testing and in sound field (e.g. using VRA). When the pediatric noise stimuli is selected, the Warble light indicator (25) will blink.

3.5.6 Speech Test

Speech testing can be done via pre-recorded wave files (26) (if installed), microphone (27) or CD input (28).

Most people acquire hearing aids because they themselves or their relatives report that they have trouble hearing speech. Speech audiometry has the advantage of othe ars speech signals and is used to quantify the patient"s ability to understand everyday communication. It examines the patient"s processing ability in relation to their degree and type of hearing loss which can vary greatly between patients with the same hearing loss configuration.

Speech audiometry can be performed using a number of tests. For example, SRT (Speech Reception Threshold) refers to the level at which the patient can repeat 50% of the presented words correctly. It serves as a check of the pure tone audiogram, gives an index of hearing sensitivity for speech and helps determine the starting point for other supra-threshold measures such as WR (Word Recognition). WR is sometimes also referred to as SDS (Speech Discrimination Scores) and represents the number of words correctly repeated expressed as a percentage.
Note that there is a predictable relationship between the patients pure tone threshold and speech threshold. Speech audiometry may therefore be useful as a cross-check of the pure tone audiogram.

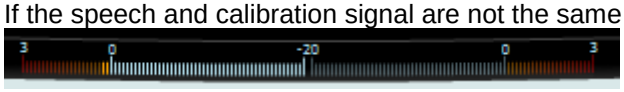


The speech screen set up in graph mode using live voice/MIC (27) - under Setup (19).

Hold in the Mic (27) and CD (28) button in to adjust the live voice or CD input level. Adjust the levels for the until you reach an average of approximately 0 dB VU on the VU meter.

NOTICE

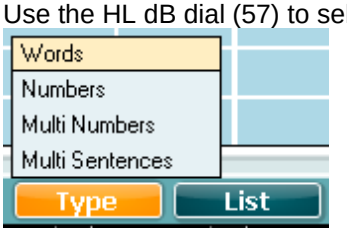
If the speech and calibration signal are not the same level, it must be manually corrected.



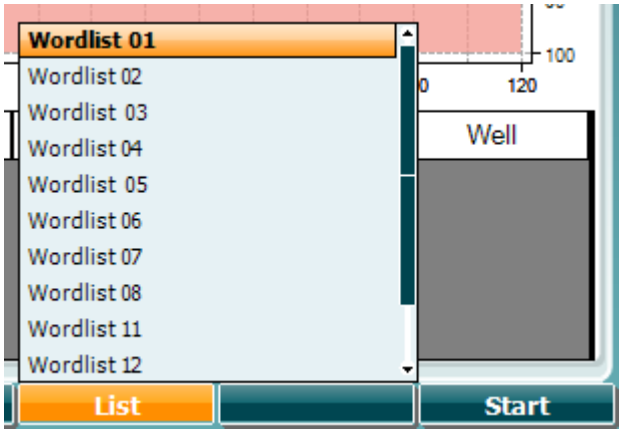
The speech screen set up in table mode using wave files (26) - under Setup (19).

	Function Key	Description
10	HF phone	Only available if High Frequency is available (optional license) on the instrument. Selects the HF phone connected to the separate HF connectors.
11	Meas.type	Choose between HL, MCL and UCL by holding the Function Key (10) and select the required measuring type by using one of the rotary wheels (56)/(57).
12	Condition	The condition under which the speech test is done: None, Aided, Binaural or Aided & Binaural.
13	Magnify	Switch between magnified top bar and normal sized top bar.

14 **Type** Use the HL dB dial (57) to select the different items from the lists:



15 **List** Different lists can be changed in the “List” option. Use the HL dB dial (57) to select the different items from the lists.

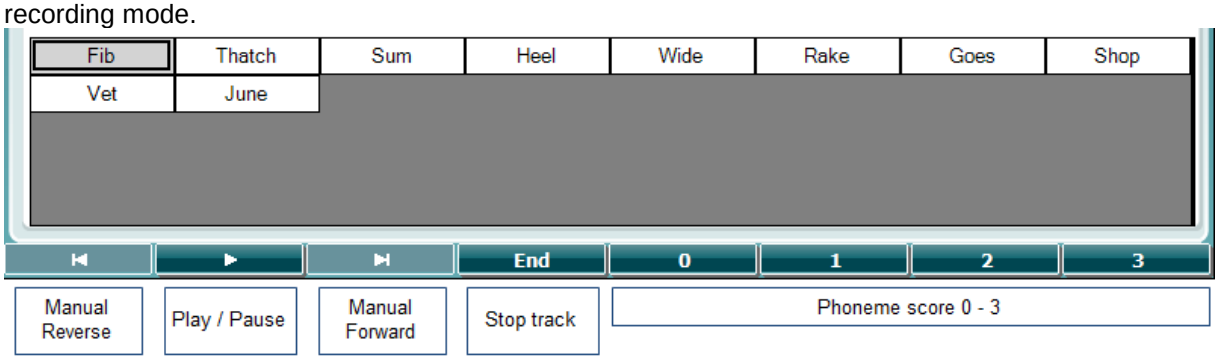


16 **Start** Start playing the wave files.

17 **End** Stop playing the wave files.

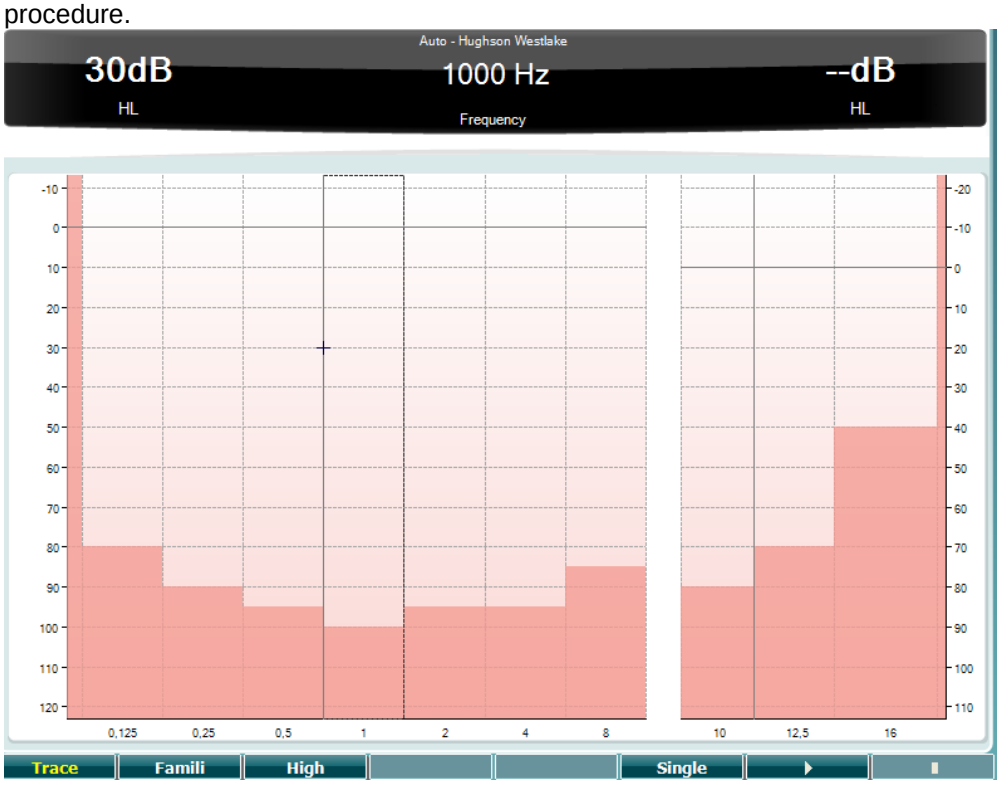
When the Wavefile test is started, the F-buttons will change to recording mode.

In recording mode, if the protocol has been set to continue/timeout after the word has been played the word will be grey colored, waiting for the operator’s input.
The input can either be Corret(56) / Incorrect(55) on the keyboard or by using the Phoneme score on the F-buttons. The tested can be paused on the play/pause button.
If the recording mode has been set to manual, the words can be selected, one by one, by using the forward/reverse button on the F-buttons, press play to play the word.
When the word-list is completed or another track has to be selected, use the End F-button to leave the recording mode.



Hughson-Westlake Test

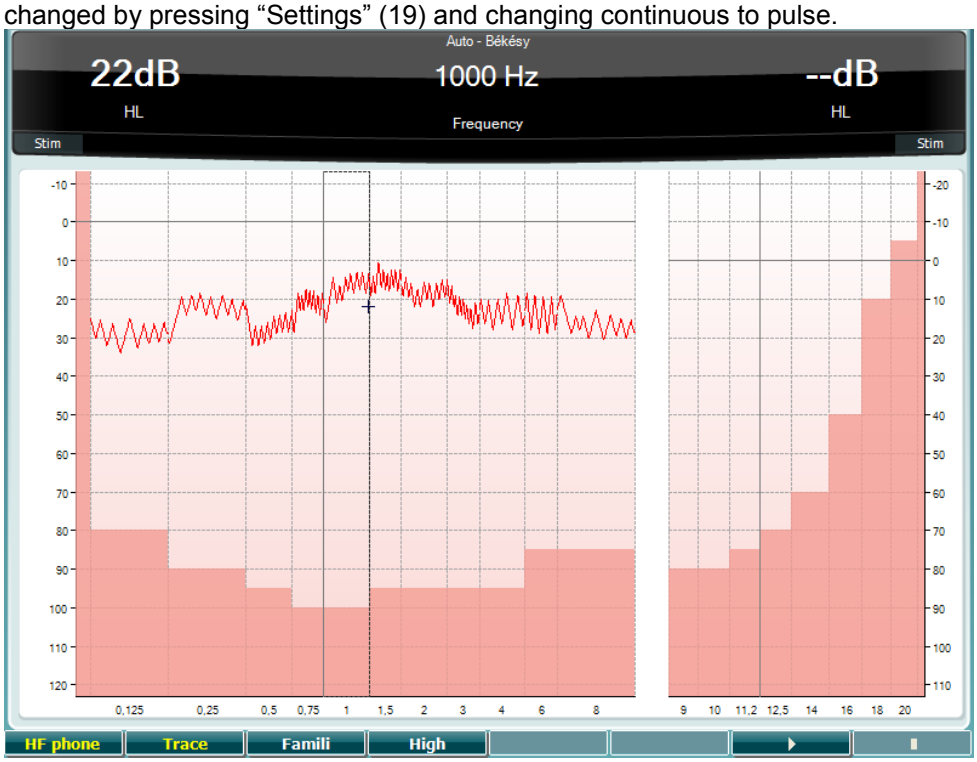
Hughson Westlake is an automatic pure tone test procedure. The threshold of hearing is defined as 2 out of 3 (or 3 out of 5) correct responses at a certain level in a 5dB increase and a 10dB decrease test procedure.



	Function Key	Description
10	Trace	Show traces
11	Famili	Select othe ars21y
12	High	Test high frequencies
15	Single	Single Freq test
16	▶	Start test. Tests all frequencies.
17	▮	Stop test.

Békésy Test

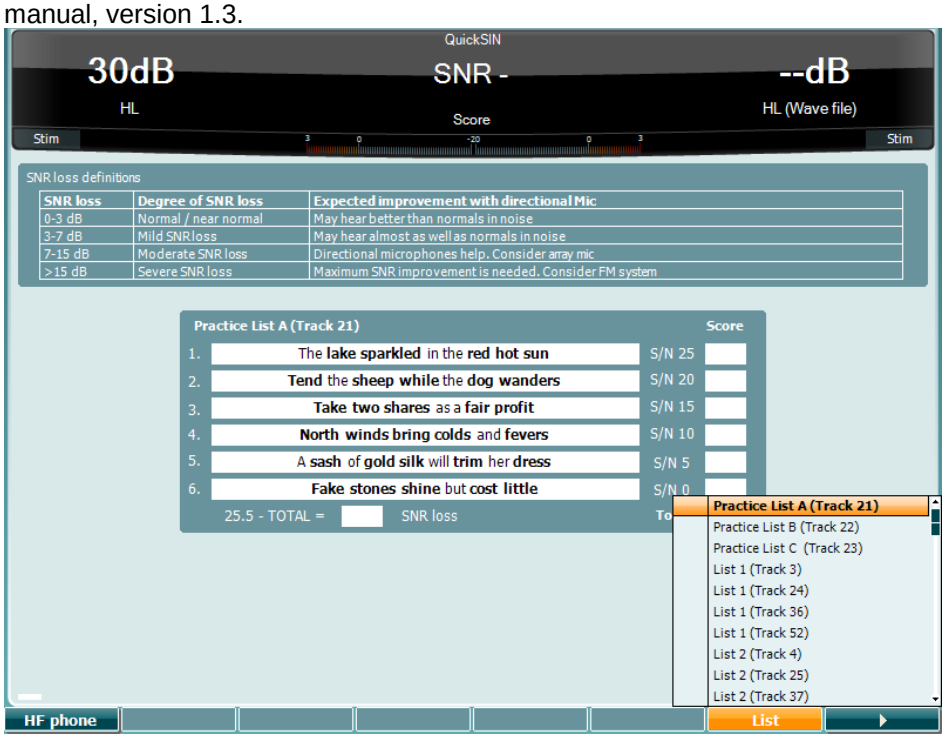
Békésy is a type of automatic audiometry. It is diagnostically important from the classification of the results into one of the five types (after Jerger, et al) when responses to continuous and pulsed tones are compared. The Békésy test is a fixed frequency test. Pure tone or narrow band noise can be selected. As a standard a continuous tone is selected for the Békésy test, if pulsing tones are preferred this can be changed by pressing “Settings” (19) and changing continuous to pulse.



Please refer to the HW Test section above for key function descriptions for Function Keys (10), (11), (12), (16), (17).

QuickSIN Test

Difficulty with hearing in background noise is a common complaint among hearing aid users. Therefore, the measurement of SNR loss (signal-to-noise ratio loss) is important because a person's ability to understand speech in noise cannot be reliably predicted from the pure tone audiogram. The QuickSIN test was developed to provide a quick estimate of SNR loss. A list of six sentences with five key words per sentence is presented in four-talker babble noise. The sentences are presented at pre-recorded signal-to-noise ratios which decrease in 5-dB steps from 25 (very easy) to 0 (extremely difficult). The SNRs used are: 25, 20, 15, 10, 5 and 0, encompassing normal to severely impaired performance in noise. For more information please refer to Etymotic Research's *QuickSIN™ Speech-in-Noise Test* manual, version 1.3.



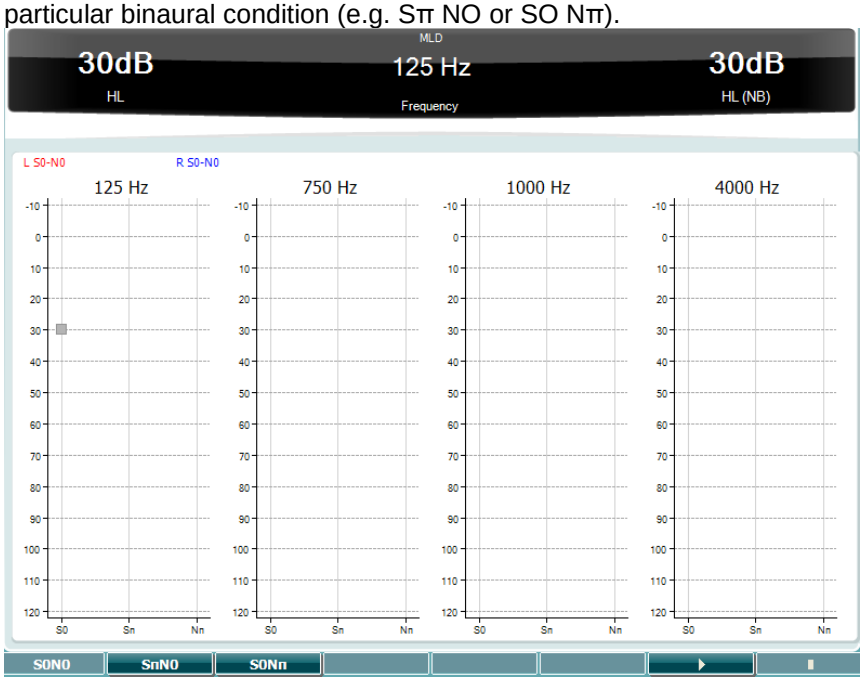
	Function Key	Description
10	HF phone	Only available if High Frequency is available (optional license) on the instrument. Selects the HF phone connected to the separate HF connectors.
16	List	Different lists can be changed in the "List" option. Use the HL dB dial (57) to select the different items in the lists.
17	▶	Start QuickSIN test

Masking Level Difference Test

MLD refers to the improvement in speech intelligibility in noise when a tone is presented in and out of phase respectively. It aims to assess central auditory function but peripheral changes may also affect the MLD.

The auditory system has the ability to perceive differences in timing of a sound reaching the two ears. This helps to othe ar low frequency sounds that reach the ears at different times due to the longer wave length.

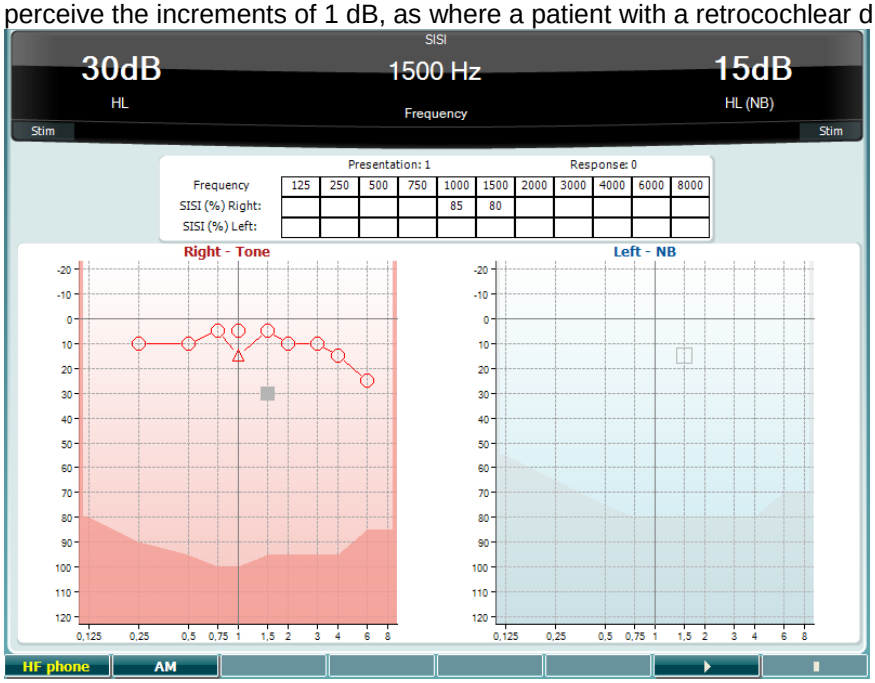
It is measured by simultaneously presenting a 500 Hz interrupted and narrow band noise at 60 dB to both ears in phase andfinding the threshold. Then the phase of one of the tones is inversed and the threshold is found once again. The improvement in sensitivity will be greater in the out-of-phase condition. The MLD equals the difference between the in-phase and out-of-phase thresholds or more formally the MLD may be defined as the difference in dB between the binaural (or monaural) in phase condition (SO NO) and a particular binaural condition (e.g. Sπ NO or SO Nπ).



	Function Key	Description
10	S0N0	othe ars in phase
11	SnN0	Noise in phase and signal in reversed phase.
12	S0Nn	Signal is in phase and the noise in reversed phase.
16	▶	Start MLD test.
17	■	Stop MLD test.

SISI Test

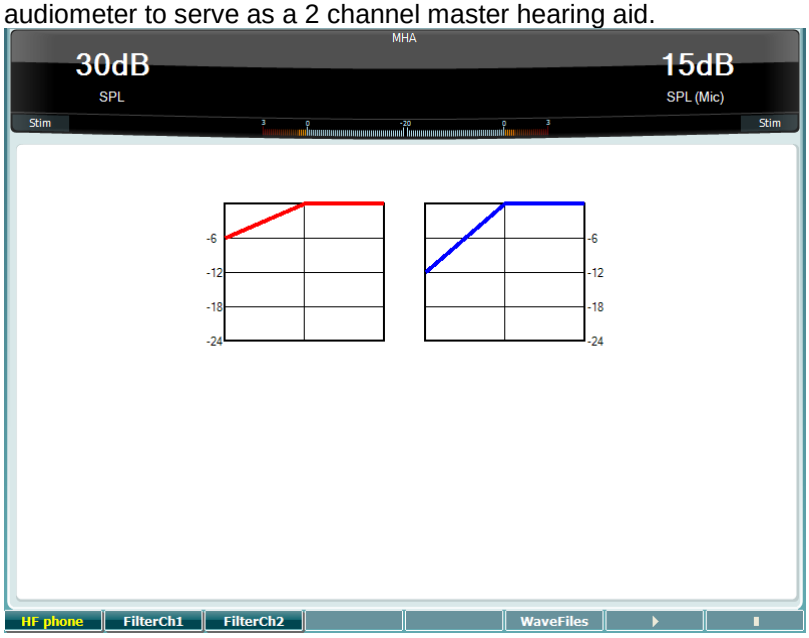
SISI is designed to test the ability to recognise 1 dB increase in intensity during a series of bursts of pure tones presented 20 dB above the pure tone threshold for the test frequency. It can be used to differentiate between cochlear and retrocochlear disorders as a patient with a cochlear disorder will be able to perceive the increments of 1 dB, as where a patient with a retrocochlear disorder will not.



	Function Key	Description
10	HF phone	Only available if High Frequency is available (optional license) on the instrument. Selects the HF phone connected to the separate HF connectors.
11	AM	Amplitude Modulation
16	▶	Start SISI test.
17	▮	Stop SISI test.

Master Hearing Aid Test

MHA is a hearing aid simulator that consists of three high pass filters of -6 dB, -12 dB, -18 dB per octave and a HFE filter (High Frequency Emphasis) equivalent to -24 dB per octave through the audiometric headphones. This gives a sense of the benefits of a hearing aid and what could eventually be gained by getting properly fitted hearing aids. The filters can be activated individually on both channels enabling the audiometer to serve as a 2 channel master hearing aid.



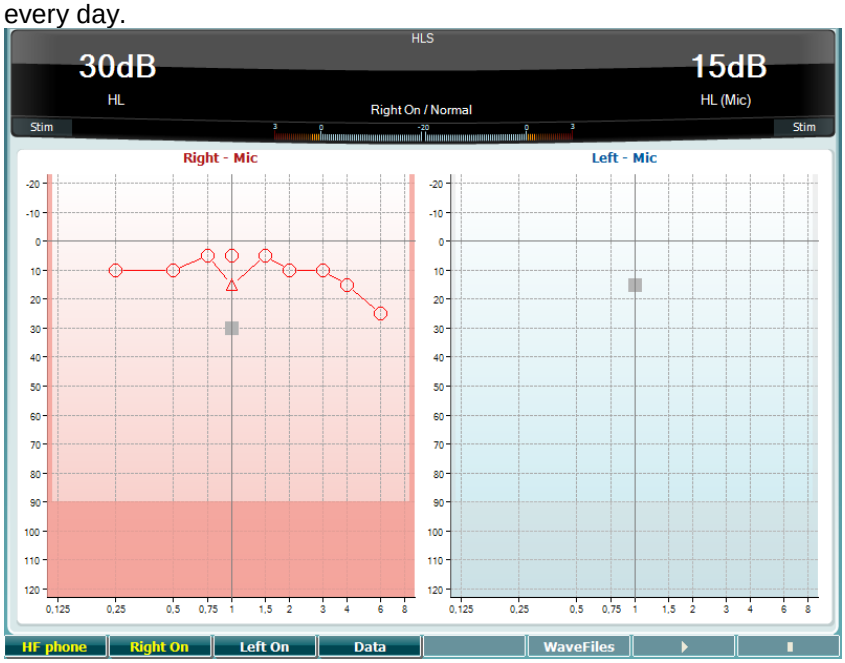
	Function Key	Description
10	HF phone	Only available if High Frequency is available (optional license) on the instrument. Selects the HF phone connected to the separate HF connectors.
11	FilterCh1	Filter channel 1
12	FilterCh2	Filter channel 2
15	WaveFiles	If MHA/HIS wave file is installed they can be selected here.
16	▶	Start MHA test
17	▮	Stop MHA test

MHA/HIS wave files can be installed the following way:

1. Zip the selected wave files into a file named “update_mha.mywavefiles.bin” (make sure the file extension is bin and not zip)
2. Copy the files to a newly FAT32 formated USB memory stick
3. Insert the stick into one of the USB connections on the AC40.
4. Go to Common Setup and press “Install”
5. Wait for the installation to complete.
6. Restart the AC40.

Hearing Loss Simulation Test

The HLS offers a simulation of the hearing loss through the audiometric headphones or the high frequency headset and is primarily aimed at the family members of the hearing impaired. It is a valuable tool as a hearing loss in many families may result in frustrations and misunderstandings. Knowing what the hearing loss actually sounds like gives an impression of what the hearing impaired goes through every day.

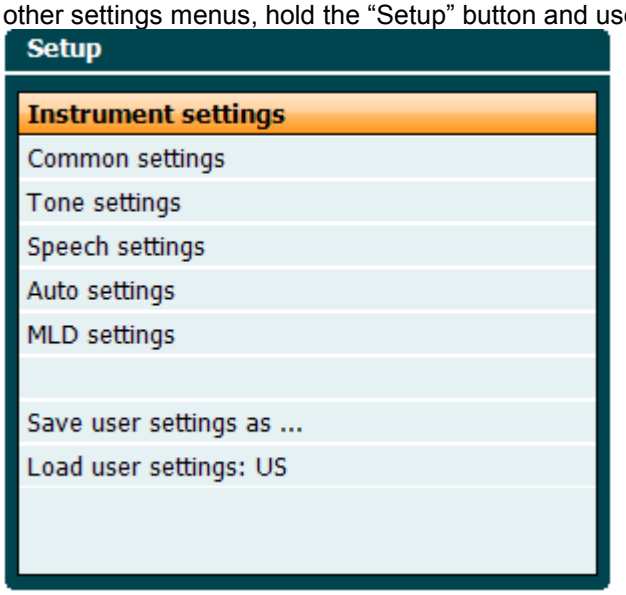


	Function Key	Description
10	HF phone	Only available if High Frequency is available (optional license) on the instrument. Selects the HF phone connected to the separate HF connectors.
11	Right On	Right channel on.
12	Left On	Left channel on.
13	Data	Select which audiogram data to use for the HLS test.
15	WaveFiles	If MHA/HIS wave file is installed they can be selected here.
16	▶	Start HLS test
17	▮	Stop HLS test

The HIS test uses the same wave files as the MHA test screen and is installed in the same way. Please see above.

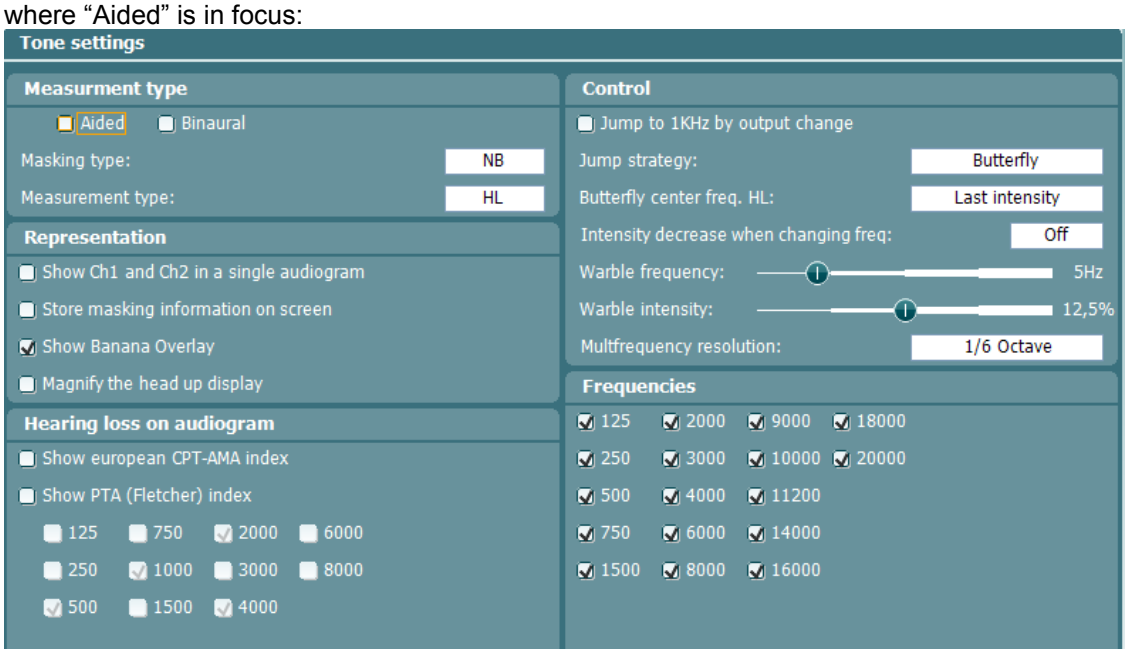
3.6 Setup

Allows the clinician to make changes in certain settings within each test and to change the common settings for the instrument. A single push will by default enter the selected Test Settings menu. To enter other settings menus, hold the “Setup” button and use on of the rotary wheels (57)/(58) to select:



To save the settings use “Save all settings as...”.
To use another user setting (protocol/profile) use “Load user settings: ‘name of user setting’....”.

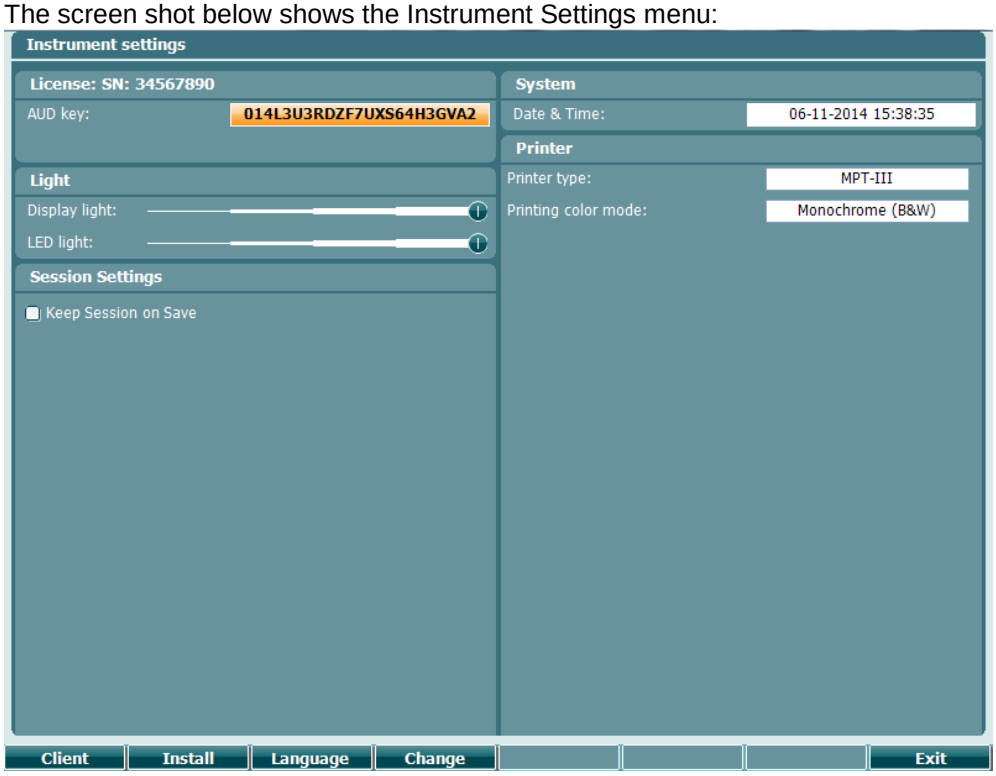
Inside a settings menu, choose between the different settings using the right rotary wheel (58). Change the individual settings using the left rotary wheel (57). Here an example from the Tone settings dialogue where “Aided” is in focus:



For a detailed description of the setting dialog, please refer to AC40 Quick Guides found here:
http://www.interacoustics.com/ac40

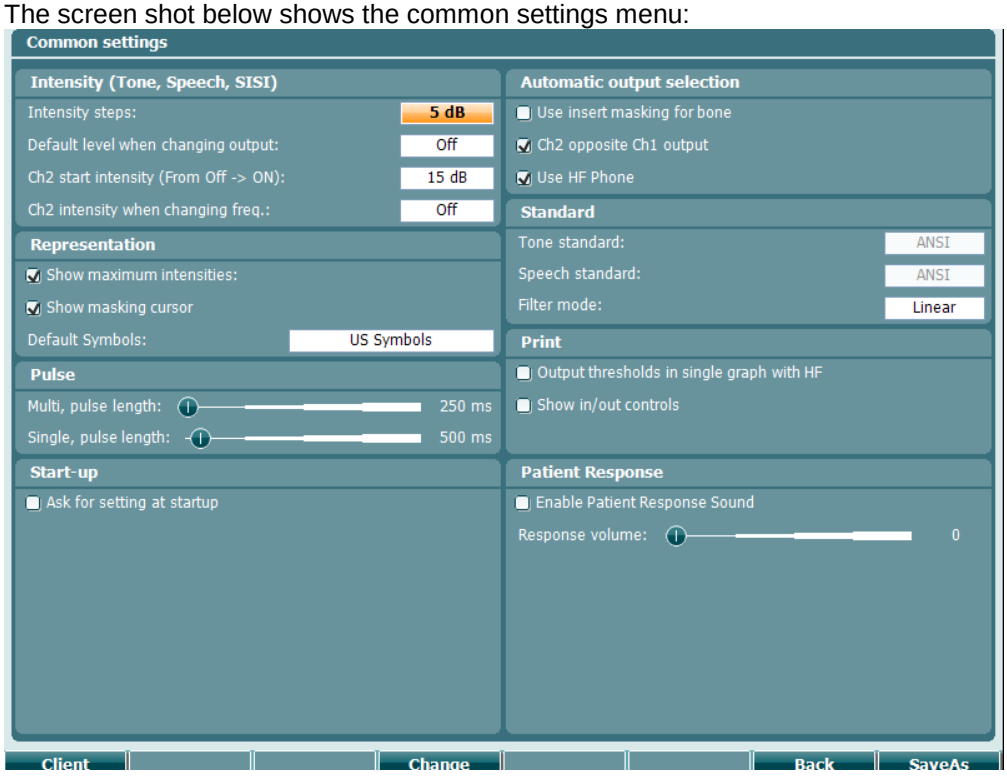
3.6.1 Instrument Setup

The screen shot below shows the Instrument Settings menu:

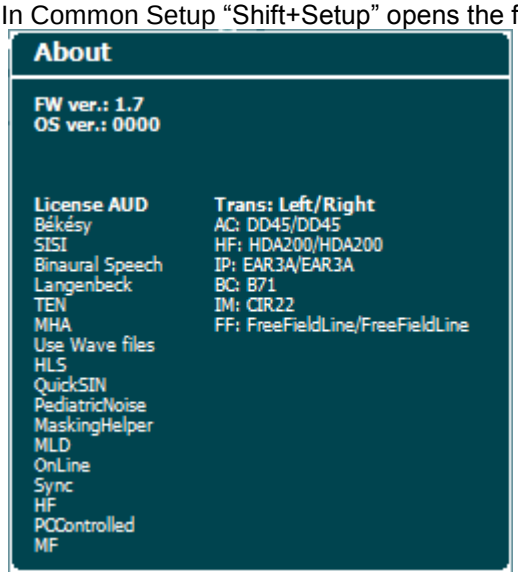


3.6.2 Common settings

The screen shot below shows the common settings menu:



In Common Setup “Shift+Setup” opens the following About box:

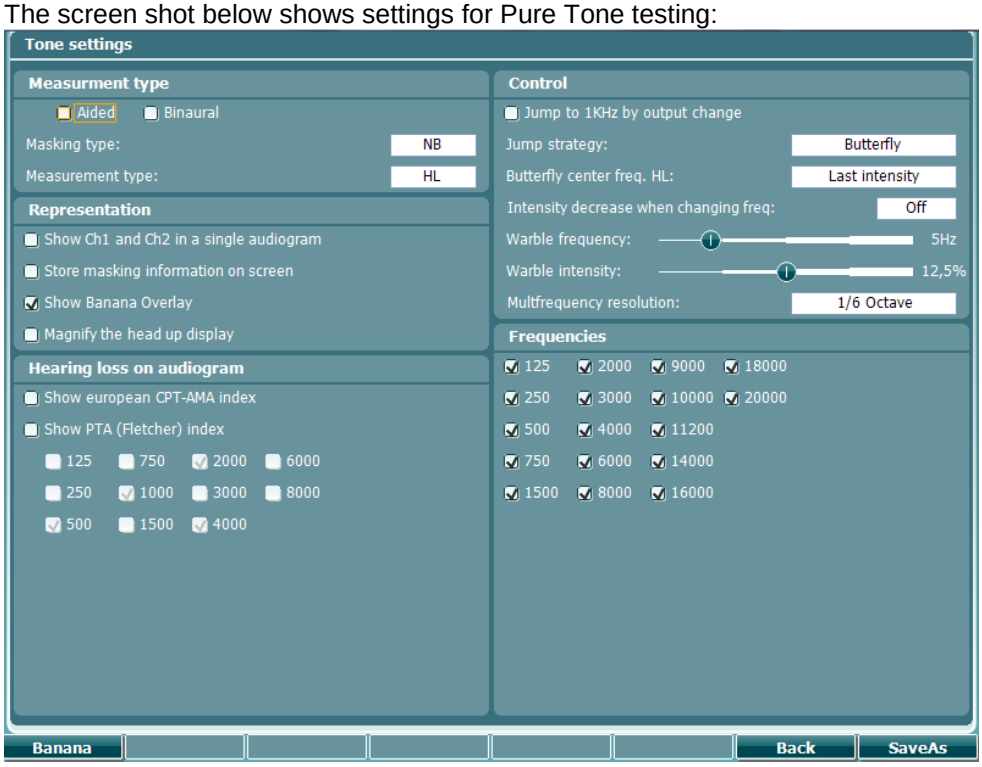


	Function keys	Description
10	Client	Select client list.
11	Install / Uninstall	Install new firmware or wave files from USB stick. Uninstall items. Use shift to activate this.
16	Back	Go back.
17	SaveAs	Save user setting (protocol)

New audiometric symbol schemes are installed via the Diagnostic Suite under General Setup. The same applies to the clinic logo shown on the direct printout.

3.6.3 Tone setting

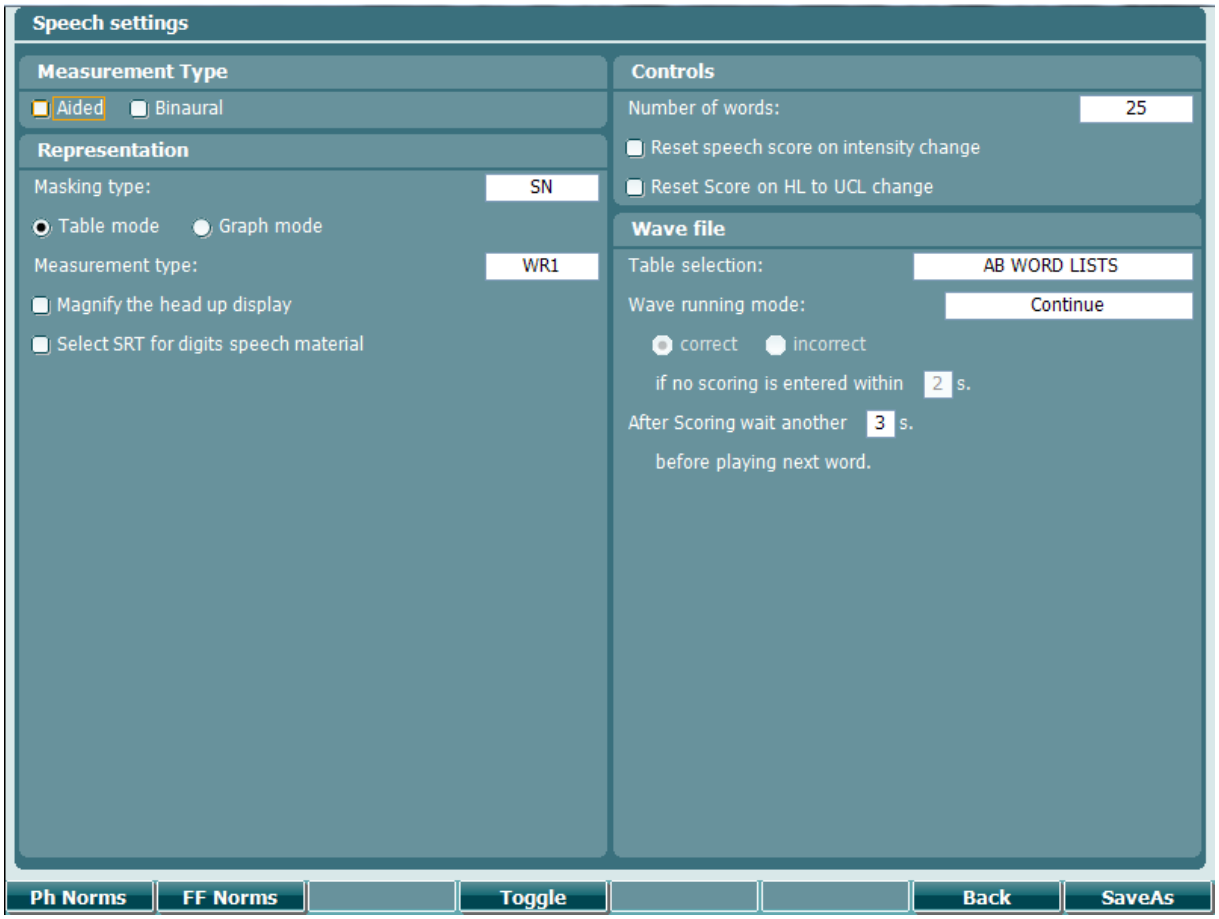
The screen shot below shows settings for Pure Tone testing:



	Function key	Description
10	Banana	Show settings for the speech banana.
16	Back	Go back.
17	SaveAs	Save user setting (protocol)

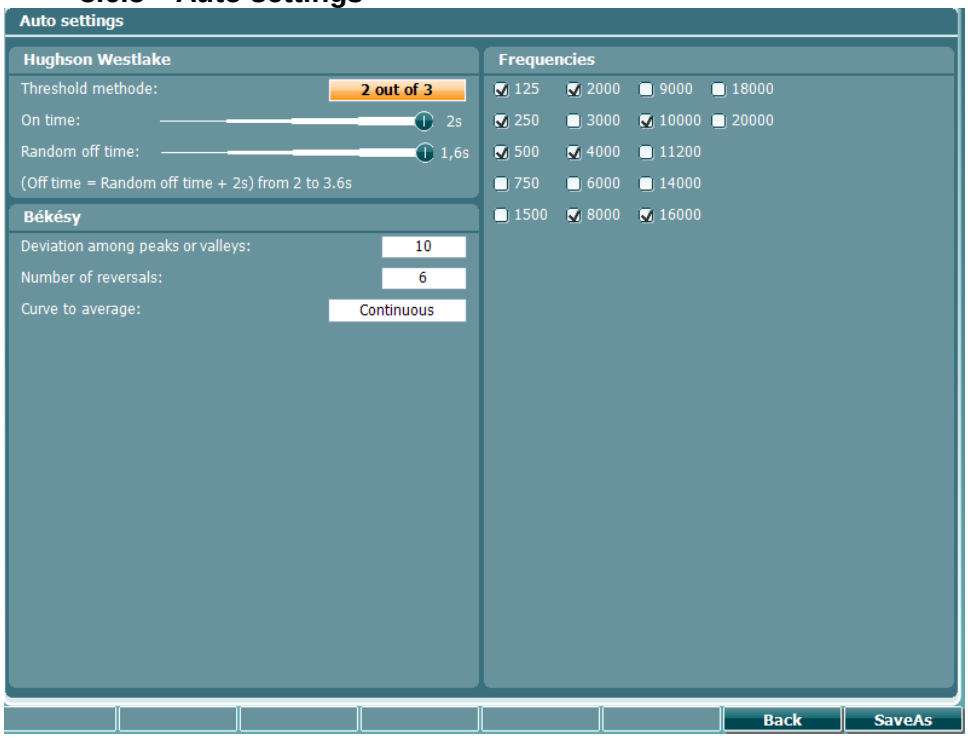
3.6.4 Speech settings

The screen shot below shows settings for Speech testing:



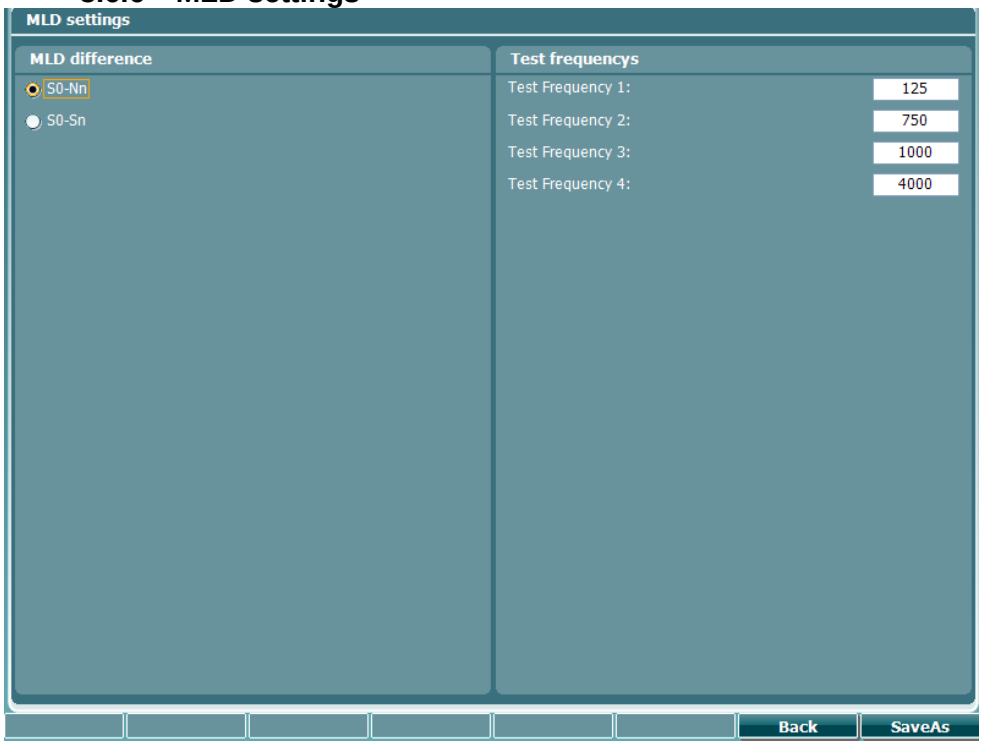
	Function key	Description
10	Ph Norms	Phonem norm curve settings.
11	FF Norms	FF norm curve setting.
16	Back	Go back.
17	SaveAs	Save user setting (protocol)

3.6.5 Auto settings



	Function key	Description
16	Back	Go back.
17	SaveAs	Save user setting (protocol)

3.6.6 MLD settings

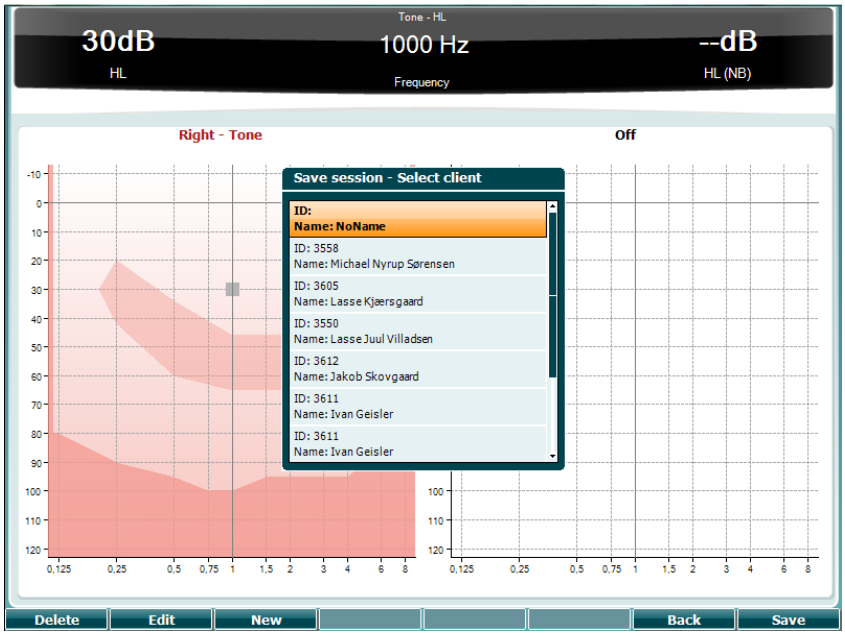


	Function keys	Description
16	Back	Go back.
17	SaveAs	Save user setting (protocol)

3.6.7 Sessions and clients

Save a session (22) after testing or alternatively create a new session by holding “Shift” (18) and pressing the “Save Session” button.
In the “Save Session” (22) menu it is possible to save sessions, delete and create clients and edit client names.

3.6.7.1 Save Session



	Function keys	Description
10	Delete	Delete the selected client.
11	Edit	Edit the selected client.
12	New	Create new client.
16	Back	Return to the session.
17	Save	Save session under the selected client.

3.6.7.2 Clients

	Function keys	Description
10	Delete	Delete the selected client.
16	Back	Return to the session.
17	Select	Access the sessions saves under the selected client.

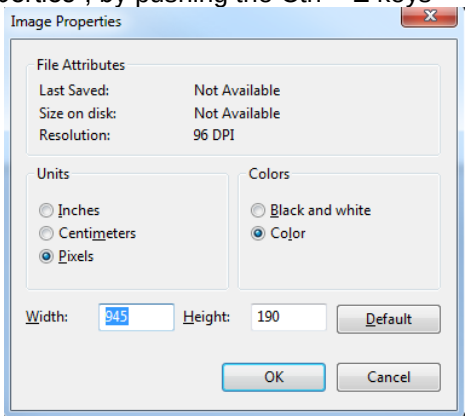
3.7 Printing

The data from the AC40 can be printed in 2 ways:

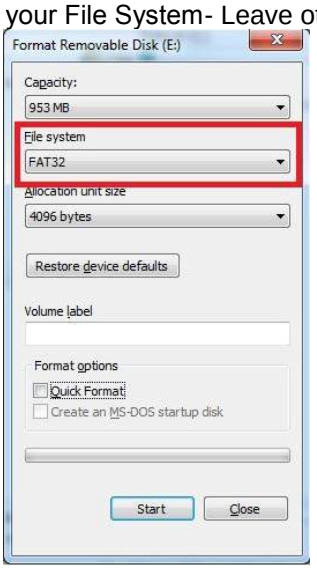
- **Direct printout:** Allows results to be printed directly after testing (via a supported USB printer – please contact Interacoustics customer service for a list of supported PC printers if in doubt). The printout logo can be configured via the audiometer itself (see below) or via the Diagnostic Suite (in the General Setup a logo impage can be downloaded to the instrument from the PC).
- **PC**: Measurements can be transferred to the Diagnostic Suite PC program (see separate operational manual) and printed via this. This allows printouts to be fully customized via the Print Wizard. It also allows for combined printouts – e.g. together with the AT235 or Titan Middle Ear Anlyzers.

3.8 AC40 Stand Alone Unit, Print Logo Update

1. Open up the “Paint” program
2. Open up “Image Properties”, by pushing the Ctrl + E keys



3. Set the “Width” to 945 and the “Height” to 190 as shown. Click on “OK”
4. Edit the Image and the Company data to fit inside the set area
5. Save the created file as “PrintLogo.bmp”
6. Zip the “PrintLogo.bmp” file to the following name “update_user.logo.bin”
   The “update_user.logo.bin” file is now ready to be used
7. Find a USB thumb drive with at least 32MB in total size and insert it into your PC
8. Go to My Computer and right click on the USB thumb drive and select ‘Format’ **Note-this will erase everything on your USB thumb drive*
9. Ensure that ‘FAT32 is selected as your File System- Leave other settings as listed



10. Click Start-depending on the size of your thumb drive these may take a while. When the format is complete you will receive a pop-up indicating it has formatted successfully
11. Copy “update_user.logo.bin” file onto the formatted thumbdrive
12. It is very important that this file and only this file is present on the USB thumb drive

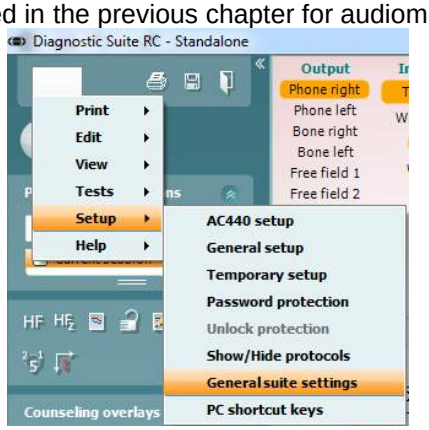
13. With the audiometer turned off insert the thumb drive into any available USB port
14. Turn on the instrument and push the Temp/Setup Button from the Tone test screen
15. Enter “Common Settings” using the Setup/Tests Button
16. For the question “Do you want to install” press the “Yes” button
17. After installation is completed, press the “Back” button to get to the testing screen

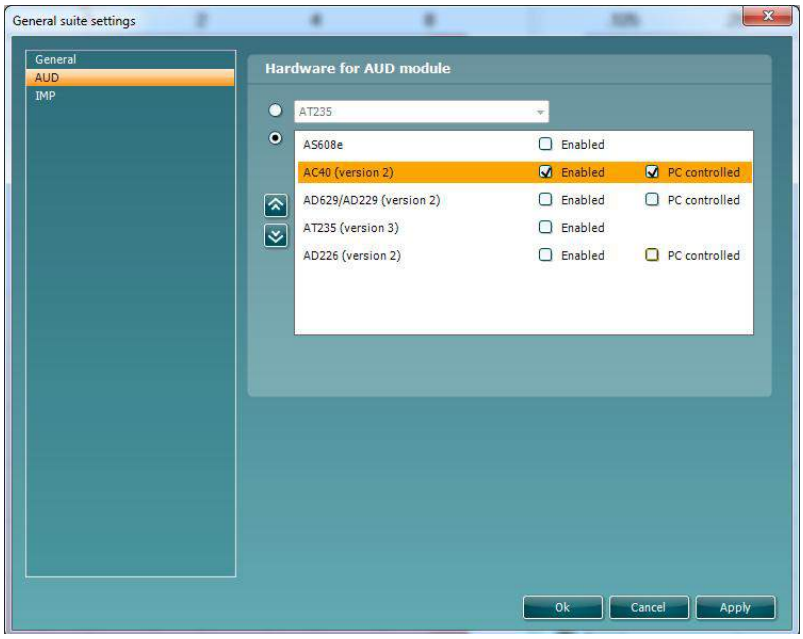
3.9 Diagnostic Suite

This section describes the data-transfer and hybrid mode (On-Line / PC-operated modes) supported by the new AC40.

3.9.1 Instrument setup

The setup is similar to that described in the previous chapter for audiometric data transfer.





Important: Please be sure to selected the “AC40 (version 2)” (and not “AC40”, which refers to the old version).

PC controlled instrument: Unselect this if you want to run the AC40 as a standalone audiometer (i.e. not as a hybrid audiometer) but still being connected to the Diagnostic Suite. When pressing *Save Session* on the instrument, the session will automatically be transferred to the Diagnostic Suite. See below section “Sync Mode”.

Upload Print Logo and Audiogram Symbols to AC40: A logo for direct print outs can be transferred to the AC40 using the “Up Print Logo” button. The symbol scheme used in the Diagnostic Suite can be transferred to the AC40 (when viewing the build in audiogram) by using the “Upload Custom Symbols” button. Please refer to the AC40 operational manual for info on how to change the symbol scheme on the AC40.

3.9.2 SYNC Mode

One click data transfer (Hybrid Mode disabled)

If the “PC controlled instrument” setting in the General Setup (see above) is deselected, the current audiogram will be transferred to the Diagnostic Suite as follows: When pressing *Save Session* on the instrument, the session will automatically be transferred to the Diagnostic Suite Start the suite with device connected

3.9.3 The Sync Tab

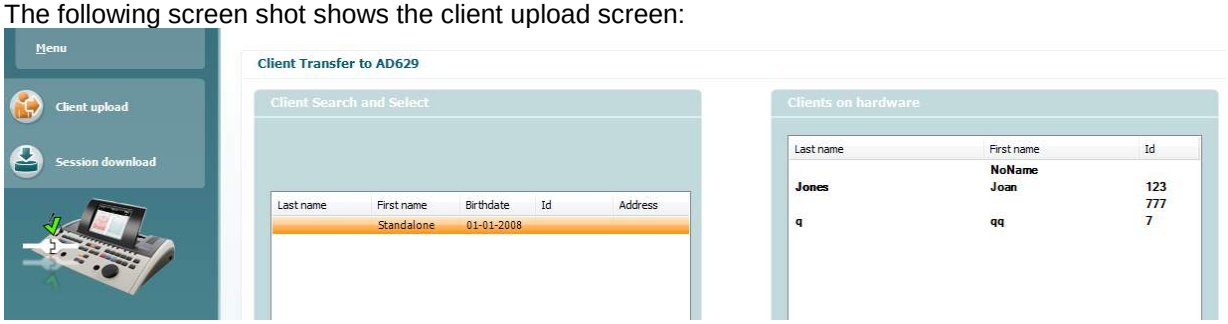
If there is several sessions stored on the AC40 (under one or more patients) then the Sync tab must be used. The screen shot below shows the Diagnostic Suite with the SYNC tab open (underneath the AUD and IMP tabs in the upper right corner).

The SYNC tab provides the following possibilities:

Client upload is used for uploading clients from the database (Noah or OtoAccess) to the AC40. The internal AC40 memory can hold up to 1000 clients and 50.000 sessions (audiogram data).
Session download is used to download sessions (audiogram data) stored in the AC40 memory into to Noah, OtoAccess or XML (when running Diagnostic suite without a database).

3.9.4 Client Upload

The following screen shot shows the client upload screen:

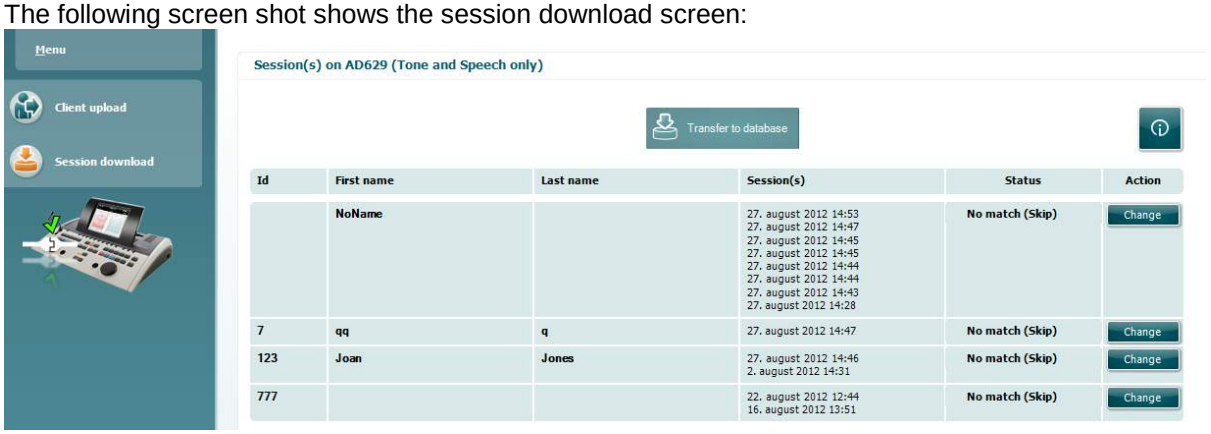


- On the left side it’s possible to search for the client in the database to transfer to the database using different search criteria’s. Use the “Add” button to transfer (upload) the client from the database to the internal AC40 memory. The internal AC40 memory can hold up to 1000 clients and 50.000 sessions (audiogram data)

- On the right side the clients currently stored on the internal AC40 memory (hardware) is down. It’s possible to remove all clients for individual clients using the “Remove all” or “Remove” buttons.

3.9.5 Session download

The following screen shot shows the session download screen:



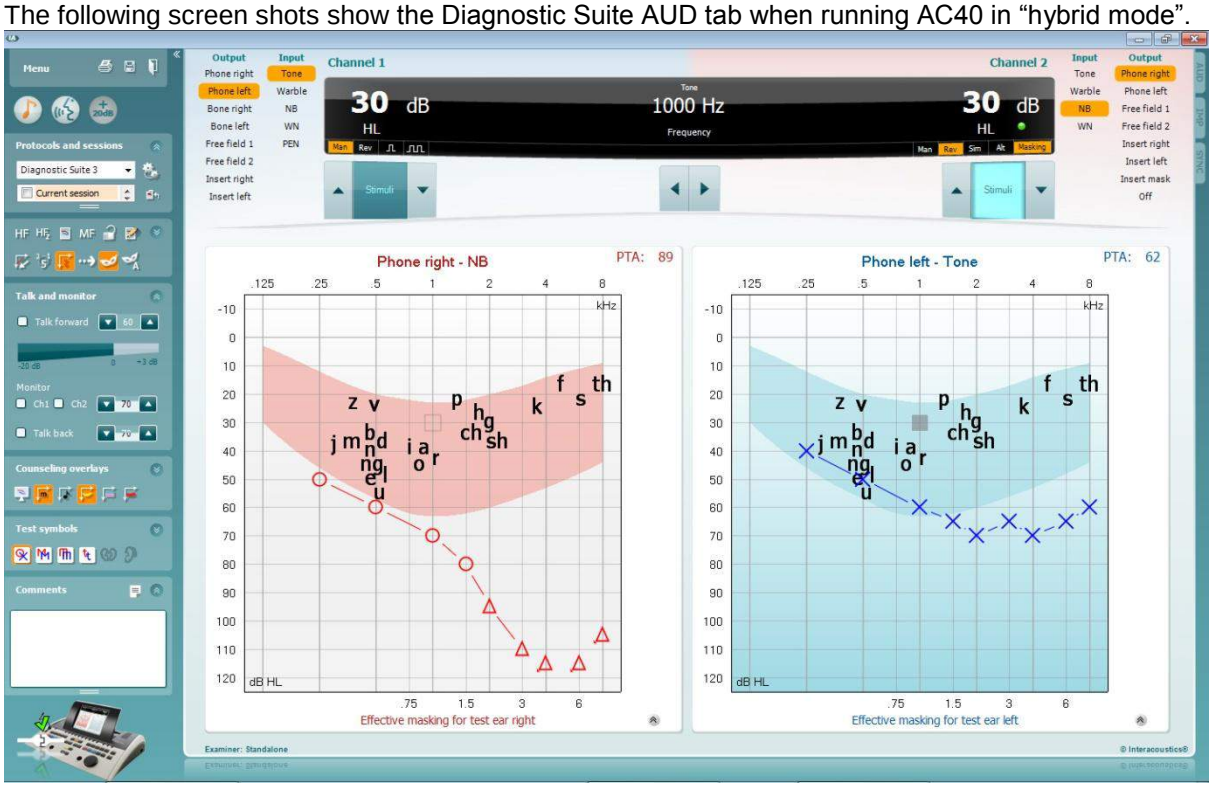
When pressing the icon the functionality of the “Session download” screen is described:

Status	Meaning
Match (Transfer)	This client on AC40 (version 2) was found (matched) in the database and the measurement will be transferred (downloaded) into the database after pressing 'Transfer to database'.
No match (Skip)	This client on AC40 (version 2) was not found (not matched) in the database and the measurement will not be transferred (downloaded) into the database after pressing 'Transfer to database'.
Download complete	The client measurement data stored on AC40 (version 2) was successfully transferred (downloaded) to the selected client in the database.

A client on the AC40 (version 2) can be transferred (downloaded) into a different (existing or new) client in the database by selecting "Change" under the "Action" column. This will open a new dialog for changing the client selection.

3.10 Hybrid (Online/PC-Controlled) Mode

The following screen shots show the Diagnostic Suite AUD tab when running AC40 in “hybrid mode”.

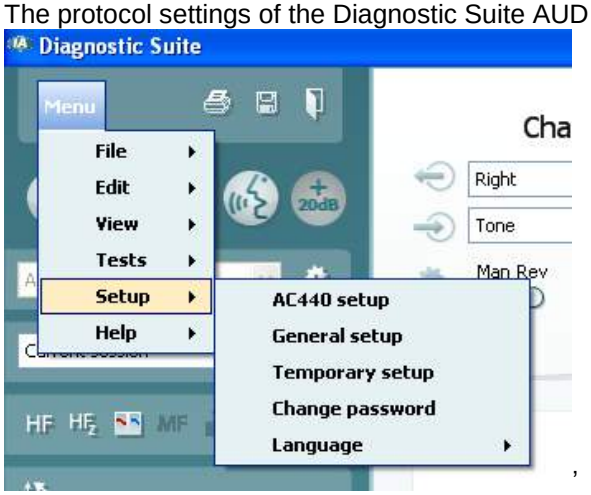


This mode allows for the AC40 to be “on-line” connected to the PC – i.e. a trued hybrid audiometer:

- Operate the unit via a PC and
- Operate the PC via the unit

The AC440 operational manual (found on www.interacoustics.com/Equinox) explains in more detail how the AUD module works when running it in hybrid mode. Please note that the AC440 manual is covering the full clinical AC440 module for the Equinox and Affinity PC-based audiometers, so some features will not be present in the AC40 Diagnostic Suite AUD module.

The protocol settings of the Diagnostic Suite AUD module can be modified under the AC440 setup:



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4 Maintenance

4.1 General Maintenance Procedures

It is recommended that routine check procedures are carried out weekly in full on all equipment in use. Check 1-9 outlined below should be followed on the equipment on each day of use.

The purpose of routine checking is to ensure that the equipment is working properly, that its calibration has not noticeably changed, and that its transducers and connections are free from any defect that might adversely affect the test result. The checking procedures should be carried out with the audiometer set up in its usual working situation. The most important elements in daily performance checks are the subjective tests and these tests can only be successfully carried out by an operator with unimpaired and preferably known good hearing. If a booth or separate test room is used, the equipment should be checked as installed; an assistant may be required in order to carry out the procedures. The checks will then cover the inter-connections between the audiometer and the equipment in the booth, and all connecting leads, plugs, and socket connections at the junction box (sound room wall) should be examined as potential sources of intermittency or incorrect connection. The ambient noise conditions during the tests should not be substantially worse than those encountered when the equipment is in use.

1) Clean and examine the audiometer and all accessories.
2) Check earphone cushions, plugs, main leads and accessory leads for signs of wear or damage. Damaged or badly worn parts should be replaced.
3) Switch on equipment and leave for the recommended warm-up time. Carry out any set-up adjustments as specified. On battery-powered equipment, check battery state using the manufacturer's specified method. Switch on equipment and leave for the recommended warm-up time. If no warm-up period is quoted, allow 5 min for circuits to stabilize. Carry out any setting-up adjustments as specified. On battery-powered equipment, check battery state.
4) Check that earphone and bone vibrator serial numbers are correct for use with the audiometer.
5) Check that audiometer output is approximately correct on both air and bone conduction by conducting a simplified audiogram on a known test subject with known hearing; check for any change.
6) Check at high level (for example hearing levels of 60 dB on air conduction and 40 dB on bone conduction) on all appropriate functions (and on both earphones) at all frequencies used; listen for proper functioning, absence of distortion, freedom from clicks, etc.
7) Check all earphones (including masking transducer) and the bone vibrator for absence of distortion and intermittency; check plugs and leads for intermittency.
8) Check that all switch knobs are secure and that indicators work correctly.
9) Check that the subject's signal system operates correctly.
10) Listen at low levels for any sign of noise, hum, or unwanted sounds (break-through arising when a signal is introduced in another channel) or for any change in tone quality as masking is introduced.
11) Check that attenuators do attenuate the signals over their full range and that attenuators which are intended to be operated while a tone is being delivered are free from electrical or mechanical noise.
12) Check that controls operate silently and that no noise radiated from the audiometer is audible at the subject's position.
13) Check subject communication speech circuits, if appropriate, applying procedures similar to those used for pure-tone function.
14) Check tension of headset headband and bone vibrator headband. Ensure that swivel joints are free to return without being excessively slack.
15) Check headbands and swivel joints on noise-excluding headsets for signs of wear strain or metal fatigue.

The instrument had been designed to provide many years of reliable service, but annual calibration is recommended due to possible impact on transducers.
We also required –recalibrating of the instrument; if something drastic happens to a part of it (e.g. headset or bone conductor is dropped on a hard surface).

Calibration procedure is available in service manual which is available on request.

NOTICE

Great care should be exercised by the handling of earphones and other transducers, as mechanical shock may cause change of calibration.

4.2 How to clean Interacoustics Products

If the surface of the instrument or parts of it are contaminated, it can be cleaned using a soft cloth moistened with a mild solution of water and dish washing cleaner or similar. The use of organic solvents and aromatic oils must be avoided. Always disconnect the USB cable during the cleaning process, and be careful that no fluid is entering the inside of the instrument or the accessories.

⚠CAUTION

- Before cleaning always switch off and disconnect from power
- Use a soft cloth lightly dampened with cleaning solution to clean all exposed surfaces
- Do not allow liquid to come in contact with the metal parts inside the earphones / headphones
- Do not autoclave, sterilize or immerse the instrument or accessory in any fluid
- Do not use hard or pointed objects to clean any part of the instrument or accessory
- Do not let parts that have been in contact with fluids dry before cleaning
- Rubber ear-tips or foam ear-tips are single use components
- Ensure isopropyl alcohol does not come into contact with any screens on the instruments

Recommended cleaning and disinfection solutions:

- Warm water with mild, nonabrasive cleaning solution (soap)
- 70% isopropyl alcohol

Procedure:

- Clean the instrument by wiping outer case with a lint free cloth lightly dampened in cleaning solution.
- Clean cushions and patient hand switch and other parts with a lint free cloth lightly dampened in cleaning solution.
- Make sure not to get moisture in the speaker portion of the earphones and similar parts

4.3 Concerning Repair

Interacoustics is only considered to be responsible for the validity of the CE marking, effects on safety, reliability and performance of the equipment if:

1. assembly operations, extensions, readjustments, modifications or repairs are carried out by authorised persons,
2. a 1 year service interval is maintained
3. the electrical installation of the relevant room complies with the appropriate requirements, and
4. the equipment is used by authorised personnel in accordance with the documentation supplied by Interacoustics.

It is important that the customer (agent) fills out the RETURN REPORT every time a problem arises and sends it to Interacoustics, 7625 Golden Triangle Drive, Eden Prairie, MN 55344, USA. This should also be done every time an instrument is returned to Interacoustics. (This of course also applies in the unthinkable worst case of death or serious deterioration to patient or user).

4.4 Warranty

Interacoustics warrants that:

- The AC40 is free from defects in material and workmanship under normal use and service for a period of 12 months from the date of delivery by Interacoustics to the first purchaser.
- Accessories are free from defects in material and workmanship under normal use and service for a period of ninety (90) days from the date of delivery by Interacoustics to the first purchaser.

If any product requires service during the applicable warranty period, the purchaser should communicate directly with the local Interacoustics service centre to determine the appropriate repair facility. Repair or replacement will be carried out at Interacoustics' expense, subject to the terms of this warranty. The product requiring service should be returned promptly, properly packed, and postage prepaid. Loss or damage in return shipment to Interacoustics shall be at purchaser's risk.

In no event shall Interacoustics be liable for any incidental, indirect or consequential damages in connection with the purchase or use of any Interacoustics product.

This shall apply solely to the original purchaser. This warranty shall not apply to any subsequent owner or holder of the product. Furthermore, this warranty shall not apply to, and Interacoustics shall not be responsible for, any loss arising in connection with the purchase or use of any Interacoustics product that has been:

- repaired by anyone other than an authorized Interacoustics service representative;
- altered in any way so as, in Interacoustics judgement, to affect its stability or reliability;
- subject to misuse or negligence or accident, or which has had the serial or lot number altered, effaced or removed; or
- improperly maintained or used in any manner other than in accordance with the instructions furnished by Interacoustics.

This warranty is in lieu of all other warranties, express or implied, and of all other obligations or liabilities of Interacoustics, and Interacoustics does not give or grant, directly or indirectly, the authority to any representative or other person to assume on behalf of Interacoustics any other liability in connection with the sale of Interacoustics products.

INTERACOUSTICS DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FOR FUNCTION OF FITNESS FOR A PARTICULAR PURPOSE OR APPLICATION.

5 General Technical Specifications

AC40 Technical Specification

Safety Standards	IEC60601-1:2005; ES60601-1:2005/A2:2010; CAN/CSA-C22.2 No. 60601-1:2008; IEC60601-1:1988+A1+A2 Class I Type B Applied parts IPx0	
EMC Standard	IEC 60601-1-2:2007	
Audiometer Standards	Tone: IEC 60645-1:2012/ANSI S3.6:2010 Type 1- Speech: IEC 60645-2:1993/ANSI S3.6:2010 Type A or A-E	
Calibration	Calibration information and instructions is located in the AC40 Service manual	
Air Conduction	TDH39: DD45: HDA300: HDA280 E.A.R Tone 3A/5A: CIR 33 IP30	ISO 389-1 1998, ANSI S3.6-2010 PTB/DTU report 2009 PTB report PTB 1.61 – 4064893/13 PTB report 2004 ISO 389-2 1994, ANSI S3.6-2010 ISO 389-2 1994 ISO 389-2 1994, ANSI S3.6-2010 DES-2361
Bone Conduction	B71: Placement: Mastoid	ISO 389-3 1994, ANSI S3.6-2010
Free Field	ISO 389-7 2005, ANSI S3.6-2010	
High Frequency	ISO 389-5 2006, ANSI S3.6-2010	
Effective masking	ISO 389-4 1994, ANSI S3.6-2010	
Transducers	TDH39 DD45 HDA300 HDA280 B71 Bone E.A.R Tone 3A/5A: CIR 33 IP30	Headband Static Force 4.5N ±0.5N Headband Static Force 4.5N ±0.5N Headband Static Force 4.5N ±0.5N Headband Static Force 5N ±0.5N Headband Static Force 5.4N ±0.5N
Patient Response switch	Two push button.	
Patient communication	Talk Forward (TF) and Talk Back (TB).	
Monitor	Real stereo output through built-in speakers or through external earphone or assistant monitor.	
Special tests/test battery (some are optional)	• Stenger • ABLB • Langenbeck (tone in noise). • Masking Level Difference • Pediatric Noise Stimuli • Multi Frequency • High Frequency • Speech from Hard-drive (Wave Files) • SISI • Master Hearing Aid • Hearing Loss Simulator • QuickSIN(tm) • Auto threshold: o Hughson Westlake o Békésy	
Stimuli		
Tone	125-20000Hz separated in two ranges 125-8000Hz and 8000-20000Hz. Resolution 1/2-1/24 octave.	
Warble Tone	1-10 Hz sine +/- 5% modulation	
Pediatric Noise	A special narrowband noise stimulus. The bandwidth is frequency depended 125-250 Hz 29%, 500Hz 24%, 750 Hz 20%, 1kHz 17%, 1.5kHz 13%, 2kHz 11%, 3kHz 9% from 4kHz and up is fix 8%,	
Wave file	44100Hz sampling, 16 bits, 2 channels	

Masking	Automatic selection of narrow band noise (or white noise) for tone presentation and speech noise for speech presentation. Narrow band noise: IEC 60645-1 2012, 5/12 Octave filter with the same centre frequency resolution as pure Tone. White noise: 80-20000Hz measured with constant bandwidth Speech Noise. IEC 60645-2:1993 125-6000Hz falling 12dB/octave above 1KHz +/-5dB					
Presentation	Manual or Reverse. Single or multiple pulses.					
Intensity	Check the accompanying Appendix Available Intensity Steps is 1, 2 or 5dB Extended range function: If not activated, the Air Conduction output will be limited to 20 dB below maximum output.					
Frequency range	125Hz to 8kHz (Optional High Frequency: 8 kHz to 20 kHz) 125Hz, 250Hz, 750Hz, 1500Hz and 8kHz may freely be deselected					
Speech	Frequency Response:					
	(Typical)	***Frequency [Hz]***	***Linear [dB]***		***FFequv [dB]***	
			Ext. sign[1]	***Int. sign[2]***	***Ext. sign[1]***	*Int. sign[2]*
	TDH39 (IEC 60318-3 Coupler)	**125-250**	**+0/-2**	**+0/-2**	**+0/-8**	+0/-8
		250-4000	+2/-2	+2/-1	+2/-2	+2/-2
		4000-6300	+1/-0	+1/-0	+1/-0	+1/-0
	DD45 (IEC 60318-3 Coupler)	125-250	+0/-2	+1/-0	+0/-8	+0/-7
		250-4000	+1/-1	+1/-1	+2/-2	+2/-3
		4000-6300	+0/-2	+0/-2	+1/-1	+1/-1
	E.A.R Tone 3A (IEC 60318-5 Coupler)	250-4000	+2/-3	+4/-1	(Non linear)	
	IP 30 (IEC 60318-5 Coupler)	250-4000	+2/-3	+4/-1	(Non linear)	
	B71 Bone Conductor (IEC 60318-6 Coupler)	250-4000	+12/-12	+12/-12	(Non linear)	
		2% THD at 1000 Hz max output +9 dB (increasing at lower frequency)				
		Level range: -10 to 60 dB HL				
		1. Ext. sign: CD input		2. Int. sign: Wave files		
External signal	Speech replaying equipment connected to the CD inputs must have a signal-to-noise ratio of 45 dB or higher. The speech material used must include a calibration signal suitable for adjusting the input to 0 dBVU.					
Free Field output (non-powered)	Power amplifier and loudspeakers With an input of 7 Vrms - Amplifier and loudspeakers must be able to create a Sound Pressure Level of 100 dB in a distance of 1 meter - and meet the following requirements: Frequency Response — Total Harmonic Distortion 125-250 Hz +0/-10 dB — 80 dB SPL < 3% 250-4000 Hz ±3 dB — 100 dB SPL < 10% 4000-6300 Hz ±5 dB					
Internal storage	500 patients and 50.000 sessions/measurements/audiograms (may depend on session type/size)					
Signal Indicator(VU)	Time weighting: 300mS Dynamic range: 23dB Rectifier characteristics: RMS Selectable inputs are provide with an attenuator by which the level can be adjusted to the indicator reference position(0dB)					
Data Connections (sockets) for connection of accessories	4 x USB A 1 x USB B for PC connection (compatible with USB 1.1 and later) 1 x LAN Ethernet (not used)					
External devices (USB)	Standard PC mouse and keyboard (for data entry) Supported printers: Please contact local distributer for a list of approved PC printers.					
HDMI output	Provides a copy of the built-in screen in HDMI format 800x600 resolution					
Input Specifications	TB	212 uVrms at max. gain for 0dB reading Input impedance : 3.2KOhm				
	Mic.2	212 uVrms at max. gain for 0dB reading Input impedance : 3.2KOhm				
	CD1/2	16mVrms at max. gain for 0dB reading Input impedance : 47KOhm				
	TF (side panel)	212uVrms at max. gain for 0dB reading Input impedance : 3.2KOhm				
	TF (front panel)	212uVrms at max. gain for 0dB reading Input impedance : 3.2KOhm				
	Wave files	Plays wave file from internal SD card				

Output Specifications	FF 1/2/3/4 Line output	7Vrms at 2KOhms load 60-20000Hz -3dB
	FF 1 / 2 / 3 / 4 - powered	4x20W (only 2x20W can be used by software at the moment)
	Left & Right	7Vrms at 10 Ohms load 60-20000Hz -3dB
	Ins. Left & Right	7Vrms at 10 Ohms load 60-20000Hz -3dB
	HF Left & Right	7Vrms at 10 Ohms load 60-20000Hz -3dB
	HLS	7Vrms at 10 Ohms load 60-20000Hz -3dB
	Bone 1+2	7Vrms at 10 Ohms load 60-20000Hz -3dB
	Ins. Mask	7Vrms at 10 Ohms load 60-20000Hz -3dB
	Monitor headset (side panel)	2x 3Vrms at 32 Ohms / 1.5Vrms at 8 Ohms load 60-20000Hz -3dB
	Assist Mon.	Max.3.5Vrms. by 8 Ω load 70Hz-20kHz ±3dB
Display	8.4 inch high resolution colour display 800x600 pixels	
Compatible software	Diagnostic Suite - Noah, OtoAccess and XML compatible	
Dimensions (LxWxH)	522 x 366 x 98 cm / 20.6 x 14.4 x 3.9 inch Hight with display open: 234 mm / 9.2 inch	
Weight	7.9kg / 17.4lb	
Power supply	110V~/0.65A – 240V~/0.3A 50-60Hz Rated at: 2xFF, 1kHz pure-tone, NBN 1kHz	
Operation environment	Temperature: Re. Humidity: Ambient pressure:	15-35°C 30-90% Non condensing 98-104 kPa
Transport and storage	Transport temperature: Storage temperature: Re. Humidity:	-20-50°C 0-50°C 10-95% Non condensing
Warm up time	Approx. 1 minute	

5.1 Reference Equivalent Threshold Values for transducers

See Appendix in English in the back of the manual.

5.2 Maximum hearing level settings provided at each test frequency

See Appendix in English in the back of the manual.

5.3 Pin Assignments

See Appendix in English in the back of the manual.

5.4 Electromagnetic Compatibility (EMC)

See Appendix in English in the back of the manual.

5.1 Survey of reference and max hearing level Tone Audiometer.

Pure Tone RETSPL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETFL	RETFL
Tone 125 Hz	47.5	45	38.5	30.5	27	26	26	26	26		
Tone 160 Hz	40.5	37.5	33.5	26	24.5	22	22	22	22		
Tone 200 Hz	33.5	31.5	29.5	22	22.5	18	18	18	18		
Tone 250 Hz	27	25.5	25	18	20	14	14	14	14	67	67
Tone 315 Hz	22.5	20	21	15.5	16	12	12	12	12	64	64
Tone 400 Hz	17.5	15	17	13.5	12	9	9	9	9	61	61
Tone 500 Hz	13	11.5	13	11	8	5.5	5.5	5.5	5.5	58	58
Tone 630 Hz	9	8.5	10.5	8	6	4	4	4	4	52.5	52.5
Tone 750 Hz	6.5	8 / 7.5	9	6	4.5	2	2	2	2	48.5	48.5
Tone 800 Hz	6.5	7	8.5	6	4	1.5	1.5	1.5	1.5	47	47
Tone 1000 Hz	6	7	7.5	5.5	2	0	0	0	0	42.5	42.5
Tone 1250 Hz	7	6.5	8.5	6	2.5	2	2	2	2	39	39
Tone 1500 Hz	8	6.5	9.5	5.5	3	2	2	2	2	36.5	36.5
Tone 1600 Hz	8	7	9	5.5	2.5	2	2	2	2	35.5	35.5
Tone 2000 Hz	8	9	8	4.5	0	3	3	3	3	31	31
Tone 2500 Hz	8	9.5	7	3	-2	5	5	5	5	29.5	29.5
Tone 3000 Hz	8	10	6.5	2.5	-3	3.5	3.5	3.5	3.5	30	30
Tone 3150 Hz	8	10	7	4	-2.5	4	4	4	4	31	31
Tone 4000 Hz	9	9.5	9.5	9.5	-0.5	5.5	5.5	5.5	5.5	35.5	35.5
Tone 5000 Hz	13	13	12	14	10.5	5	5	5	5	40	40
Tone 6000 Hz	20.5	15.5	19	17	21	2	2	2	2	40	40
Tone 6300 Hz	19	15	19	17.5	21.5	2	2	2	2	40	40
Tone 8000 Hz	12	13	18	17.5	23	0	0	0	0	40	40
Tone 9000 Hz				19	27.5						
Tone 10000 Hz				22	18						
Tone 11200 Hz				23	22						
Tone 12500 Hz				27.5	27						
Tone 14000 Hz				35	33.5						
Tone 16000 Hz				56	45.5						
Tone 18000 Hz				83	83						
Tone 20000 Hz				105	105						

DD45 6ccm uses IEC60318-3 or NBS 9A coupler and RETSPL comes from PTB – DTU report 2009-2010. Force 4.5N ±0.5N

TDH39 6ccm uses IEC60318-3 or NBS 9A coupler and RETSPL comes from ANSI S3.6 2010 and ISO 389-1 1998. Force 4.5N ±0.5N

HDA280 6ccm uses IEC60318-3 or NBS 9A coupler and RETSPL comes from ANSI S3.6 2010 and PTB 2004. Force 5.0N ±0.5N

HDA200 Artificial ear uses IEC60318-1 coupler with type 1 adaptor and RETSPL comes from ANSI S3.6 2010 and ISO 389-8 2004. Force 9N ±0.5N

HDA300 Artificial ear uses IEC60318-1 coupler with type 1 adaptor and RETSPL comes from PTB report 2012. Force 8.8N ±0.5N

IP30 / EAR3A/EAR 5A 2ccm uses ANSI S3.7-1995 IEC60318-5 coupler (HA-2 with 5mm rigid Tube) and RETSPL comes from ANSI S3.6 2010 and ISO 389-2 1994.

CIR22 / 33 2ccm uses ANSI S3.7-1995 IEC60318-5 coupler HA2 and RETSPL uses the Insert value from comes from ANSI S3.6 2010 and ISO 389-2 1994.

B71 / B81 uses ANSI S3.13 or IEC60318-6 2007 mechanical coupler and RETFL come from ANSI S3.6 2010 and ISO 389-3 1994. Force 5.4N ±0.5N

AC40 RETSPL-HL Tabel

Pure Tone max HL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
Signal	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL
Tone 125 Hz	90	90	105	100	115.0	90.0	90.0	95	90		
Tone 160 Hz	95	95	110	105	120	95	95	95	95		
Tone 200 Hz	100	100	115	105	120	100	100	100	100		
Tone 250 Hz	110	110	120	110	120	105	105	100	105	45	50
Tone 315 Hz	115	115	120	115	120	105	105	105	105	50	60
Tone 400 Hz	120	120	120	115	120	110	110	105	110	65	70
Tone 500 Hz	120	120	120	115	120	110	110	110	110	65	70
Tone 630 Hz	120	120	120	120	120	115	115	115	115	70	75
Tone 750 Hz	120	120	120	120	120	115	115	120	115	70	75
Tone 800 Hz	120	120	120	120	120	115	115	120	115	70	75
Tone 1000 Hz	120	120	120	120	120	120	120	120	120	70	85
Tone 1250 Hz	120	120	120	110	120	120	120	120	120	70	90
Tone 1500 Hz	120	120	120	115	120	120	120	120	120	70	90
Tone 1600 Hz	120	120	120	115	120	120	120	120	120	70	90
Tone 2000 Hz	120	120	120	115	120	120	120	120	120	75	90
Tone 2500 Hz	120	120	120	115	120	120	120	120	120	80	85
Tone 3000 Hz	120	120	120	115	120	120	120	120	120	80	85
Tone 3150 Hz	120	120	120	115	120	120	120	120	120	80	85
Tone 4000 Hz	120	120	120	115	120	115	115	120	115	80	85
Tone 5000 Hz	120	120	120	105	120	105	105	110	105	60	70
Tone 6000 Hz	115	120	115	105	110	100	100	105	100	50	60
Tone 6300 Hz	115	120	115	105	110	100	100	105	100	50	55
Tone 8000 Hz	110	110	105	105	110	95	95	100	90	50	50
Tone 9000 Hz				100	100						
Tone 10000 Hz				100	105						
Tone 11200 Hz				95	105						
Tone 12500 Hz				90	100						
Tone 14000 Hz				80	90						
Tone 16000 Hz				60	75						
Tone 18000 Hz				30	35						
Tone 20000 Hz				15	10						

AC40 RETSPL-HL Tabel

NB noise effective masking level											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM
NB 125 Hz	51.5	49	42.5	34.5	31.0	30.0	30.0	30	30		
NB 160 Hz	44.5	41.5	37.5	30	28.5	26	26	26	26		
NB 200 Hz	37.5	35.5	33.5	26	26.5	22	22	22	22		
NB 250 Hz	31	29.5	29	22	24	18	18	18	18	71	71
NB 315 Hz	26.5	24	25	19.5	20	16	16	16	16	68	68
NB 400 Hz	21.5	19	21	17.5	16	13	13	13	13	65	65
NB 500 Hz	17	15.5	17	15	12	9.5	9.5	9.5	9.5	62	62
NB 630 Hz	14	13.5	15.5	13	11	9	9	9	9	57.5	57.5
NB 750 Hz	11.5	12.5	14	11	9.5	7	7	7	7	53.5	53.5
NB 800 Hz	11.5	12	13.5	11	9	6.5	6.5	6.5	6.5	52	52
NB 1000 Hz	12	13	13.5	11.5	8	6	6	6	6	48.5	48.5
NB 1250 Hz	13	12.5	14.5	12	8.5	8	8	8	8	45	45
NB 1500 Hz	14	12.5	15.5	11.5	9	8	8	8	8	42.5	42.5
NB 1600 Hz	14	13	15	11.5	8.5	8	8	8	8	41.5	41.5
NB 2000 Hz	14	15	14	10.5	6	9	9	9	9	37	37
NB 2500 Hz	14	15.5	13	9	4	11	11	11	11	35.5	35.5
NB 3000 Hz	14	16	12.5	8.5	3	9.5	9.5	9.5	9.5	36	36
NB 3150 Hz	14	16	13	10	3.5	10	10	10	10	37	37
NB 4000 Hz	14	14.5	14.5	14.5	4.5	10.5	10.5	10.5	10.5	40.5	40.5
NB 5000 Hz	18	18	17	19	15.5	10	10	10	10	45	45
NB 6000 Hz	25.5	20.5	24	22	26	7	7	7	7	45	45
NB 6300 Hz	24	20	24	22.5	26.5	7	7	7	7	45	45
NB 8000 Hz	17	18	23	22.5	28	5	5	5	5	45	45
NB 9000 Hz				24	32.5						
NB 10000 Hz				27	23						
NB 11200 Hz				28	27						
NB 12500 Hz				32.5	32						
NB 14000 Hz				40	38.5						
NB 16000 Hz				61	50.5						
NB 18000 Hz				88	88						
NB 20000 Hz				110	110						
White noise	0	0	0	0	0	0	0	0	0	42.5	42.5
TEN noise	25	25				16	16				

Effective masking value is RETSPL / RETFL add 1/3 octave correction for Narrow-band noise from ANSI S3.6 2010 or ISO389-4 1994.

AC40 RETSPL-HL Tabel

NB noise max HL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	Max HL	Max HL	Max HL	Max HL	EM	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL
NB 125 Hz	75	75	75	75	80.0	90.0	90.0	85	90		
NB 160 Hz	80	85	80	80	85	95	95	90	95		
NB 200 Hz	90	90	85	80	85	100	100	95	100		
NB 250 Hz	95	95	90	85	90	105	105	100	105	35	40
NB 315 Hz	100	100	95	90	90	105	105	100	105	40	50
NB 400 Hz	105	105	95	95	95	105	105	105	105	55	60
NB 500 Hz	110	110	100	95	100	110	110	110	110	55	60
NB 630 Hz	110	110	100	95	100	110	110	110	110	60	65
NB 750 Hz	110	110	105	100	100	110	110	110	110	60	65
NB 800 Hz	110	110	105	100	105	110	110	110	110	60	65
NB 1000 Hz	110	110	105	100	105	110	110	110	110	60	70
NB 1250 Hz	110	110	105	95	105	110	110	110	110	60	75
NB 1500 Hz	110	110	105	100	105	110	110	110	110	60	75
NB 1600 Hz	110	110	105	100	105	110	110	110	110	60	75
NB 2000 Hz	110	110	105	100	105	110	110	110	110	65	70
NB 2500 Hz	110	110	105	100	110	110	110	110	110	65	65
NB 3000 Hz	110	110	105	100	110	110	110	110	110	65	65
NB 3150 Hz	110	110	105	100	110	110	110	110	110	65	65
NB 4000 Hz	110	110	105	100	110	110	110	110	105	65	60
NB 5000 Hz	110	110	105	95	100	105	105	110	95	50	55
NB 6000 Hz	105	110	95	90	95	100	100	105	95	45	50
NB 6300 Hz	105	110	95	90	95	100	100	105	95	40	45
NB 8000 Hz	100	100	90	90	95	95	95	100	90	40	40
NB 9000 Hz				85	90						
NB 10000 Hz				85	95						
NB 11200 Hz				80	90						
NB 12500 Hz				75	85						
NB 14000 Hz				70	75						
NB 16000 Hz				50	60						
NB 18000 Hz				20	20						
NB 20000 Hz				0	0						
White noise	120	120	120	115	115	110	110	110	110	70	70
TEN noise	110	110				100	100				

5.2 Maximum hearing level settings provided at each test frequency

ANSI Speech RETSPL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETFL	RETFL
Speech	18.5	19.5	20	19	14.5						
Speech Equ.FF.	18.5	15.5	21.5	18.5	16						
Speech Non-linear	6	7	7.5	5.5	2	12.5	12.5	12.5	12.5	55	55
Speech noise	18.5	19.5	20	19	14.5						
Speech noise Equ.FF.	18.5	15.5	21.5	18.5	16						
Speech noise Non-linear	6	7	7.5	5.5	2	12.5	12.5	12.5	12.5	55	55
White noise in speech	21	22	22.5	21.5	17	15	15	15	15	57.5	57.5

DD45 (G_F-G_C) PTB-DTU report 2009-2010.

TDH39 (G_F-G_C) ANSI S3.6 2010.

HDA280 (G_F-G_C) PTB report 2004

HDA200 (G_F-G_C) ANSI S3.6 2010 and ISO 389-8 2004.

HDA300 (G_F-G_C) PTB report 2013.

ANSI Speech level 12.5 dB + 1 kHz RETSPL ANSI S3.6 2010 (acoustical linear weighting)

ANSI Speech Equivalent free field level 12.5 dB + 1 kHz RETSPL – (G_F-G_C) from ANSI S3.6 2010(acoustical equivalent sensitivity weighting)

ANSI Speech Not linear level 1 kHz RETSPL ANSI S3.6 2010 (DD45-TDH39-HDA200-HDA300) and EAR 3A –IP30-CIR22/33- B71-B81 12.5 dB + 1 kHz RETSPL ANSI S3.6 2010 (no weighting)

ANSI Speech max HL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL
Speech	110	110	100	90	100						
Speech Equ.FF.	100	105	95	85	95						
Speech Non-linear	120	120	120	110	120	110	110	110	100	60	60
Speech noise	100	100	95	85	95						
Speech noise Equ.FF.	100	100	90	80	95						
Speech noise Non-linear	115	115	120	105	120	110	110	100	100	50	50
White noise in speech	95	95	95	90	100	95	95	95	95	55	60

AC40 RETSPL-HL Tabel

IEC Speech RETSPL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETFL	RETFL
Speech	20	20	20	20	20						
Speech Equ.FF.	3.5	0.5	6.5	3.5	1						
Speech Non-linear	6	7	7.5	5.5	2	20	20	20	20	55	55
Speech noise	20	20	20	20	20						
Speech noise Equ.FF.	3.5	0.5	6.5	3.5	1						
Speech noise Non-linear	6	7	7.5	5.5	2	20	20	20	20	55	55
White noise in speech	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	57.5	57.5

DD45 (G_F-G_C) PTB-DTU report 2009-2010.

TDH39 (G_F-G_C) IEC60645-2 1997.

HDA280 (G_F-G_C) PTB report 2004

HDA200 (G_F-G_C) ANSI S3.6 2010 and ISO 389-8 2004.

HDA300 (G_F-G_C) PTB report 2013.

IEC Speech level IEC60645-2 1997 (acoustical linear weighting)

IEC Speech Equivalent free field level (G_F-G_C) from IEC60645-2 1997 (acoustical equivalent sensitivity weighting)

IEC Speech Not linear level 1 kHz RETSPL (DD45-TDH50-HDA200-HDA300) and EAR 3A – IP30 - B71- B81 IEC60645-2 1997 (no weighting)

IEC Speech max HL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL
Speech	110	110	100	90	95						
Speech Equ.FF.	115	120	110	100	110						
Speech Non-linear	120	120	120	110	120	100	100	100	90	60	60
Speech noise	100	100	95	85	90						
Speech noise Equ.FF.	115	115	105	95	110						
Speech noise Non-linear	115	115	120	105	120	90	90	90	90	50	50
White noise in speech	95	95	95	90	95	85	85	85	85	55	60

AC40 RETSPL-HL Tabel

Sweden Speech RETSPL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETFL	RETFL
Speech	22	22	20	20	20						
Speech Equ.FF.	3.5	0.5	6.5	3.5	1						
Speech Non-linear	22	22	7.5	5.5	2	21	21	21	21	55	55
Speech noise	27	27	20	20	20						
Speech noise Equ.FF.	3.5	0.5	6.5	3.5	1						
Speech noise Non-linear	27	27	7.5	5.5	2	26	26	26	26	55	55
White noise in speech	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	57.5	57.5

DD45 (G_F-G_C) PTB-DTU report 2009-2010.

TDH39 (G_F-G_C) IEC60645-2 1997.

HDA280 (G_F-G_C) PTB report 2004

HDA200 (G_F-G_C) ANSI S3.6 2010 and ISO 389-8 2004.

HDA300 (G_F-G_C) PTB report 2013.

Sweden Speech level STAF 1996 and IEC60645-2 1997 (acoustical linear weighting)

Sweden Speech Equivalent free field level (G_F-G_C) from IEC60645-2 1997 (acoustical equivalent sensitivity weighting)

Sweden Speech Not linear level 1 kHz RETSPL (DD45-TDH39-HDA200-HDA300) and EAR 3A – IP30 – CIR22/33 - B71- B81 STAF 1996 and IEC60645-2 1997 (no weighting)

Sweden Speech max HL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL
Speech	108	108	100	90	95						
Speech Equ.FF.	115	120	110	100	110						
Speech Non-linear	104	105	120	110	120	99	99	99	89	60	60
Speech noise	93	93	95	85	90						
Speech noise Equ.FF.	115	115	105	95	110						
Speech noise Non-linear	94	95	120	105	120	84	84	84	84	50	50
White noise in speech	95	95	95	90	95	85	85	85	85	55	60

AC40 RETSPL-HL Tabel

Norway Speech RETSPL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETSPL	RETFL	RETFL
Speech	40	40	40	40	40						
Speech Equ.FF.	3.5	0.5	6.5	3.5	1						
Speech Non-linear	6	7	7.5	5.5	2	40	40	40	40	75	75
Speech noise	40	40	40	40	40						
Speech noise Equ.FF.	3.5	0.5	6.5	3.5	1						
Speech noise Non-linear	6	7	7.5	5.5	2	40	40	40	40	75	75
White noise in speech	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	57.5	57.5

DD45 (G_F-G_C) PTB-DTU report 2009-2010.

TDH39 (G_F-G_C) IEC60645-2 1997.

HDA280 (G_F-G_C) PTB report 2004

HDA200 (G_F-G_C) ANSI S3.6 2010 and ISO 389-8 2004.

HDA300 (G_F-G_C) PTB report 2013.

Norway Speech level IEC60645-2 1997+20dB (acoustical linear weighting)

Norway Speech Equivalent free field level (G_F-G_C) from IEC60645-2 1997 (acoustical equivalent sensitivity weighting)

Norway Speech Not linear level 1 kHz RETSPL (DD45-TDH39-HDA200-HDA300) and EAR 3A – IP30 – CIR22/33 - B71- B81 IEC60645-2 1997 +20dB (no weighting)

Norway Speech max HL											
Transducer	DD45	TDH39	HDA280	HDA200	HDA300	EAR3A	IP30	EAR5A	CIR22/33	B71	B81
Impedance	10 Ω	10 Ω	37 Ω	40 Ω	23 Ω	10 Ω	10 Ω	10 Ω	68 Ω	10 Ω	12.5 Ω
Coupler	6ccm	6ccm	6ccm	Artificial ear	Artificial ear	2ccm	2ccm	2ccm	2ccm	Mastoid	Mastoid
	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL	Max HL
Speech	90	90	80	70	75						
Speech Equ.FF.	115	120	110	100	110						
Speech Non-linear	120	120	120	110	120	80	80	80	70	40	40
Speech noise	80	80	75	65	70						
Speech noise Equ.FF.	115	115	105	95	110						
Speech noise Non-linear	115	115	120	105	120	70	70	70	70	30	30
White noise in speech	95	95	95	90	95	85	85	85	85	55	60

AC40 RETSPL-HL Tabel

Free Field

ANSI S3.6-2010					Free Field max SPL			
ISO 389-7 2005					Free Field max HL is found by subtracting the selected RETSPL value			
	Binaural			Binaural to Monaural	Free Field Power		Free Field Line	
	0°	45°	90°	correction	Tone	NB	Tone	NB
Frequency	RETSPL	RETSPL	RETSPL	RETSPL	Max SPL	Max SPL	Max SPL	Max SPL
Hz	dB	dB	dB	dB	dB	dB	dB	dB
125	22	21.5	21	2	97	82	102	97
160	18	17	16.5	2	93	83	98	93
200	14.5	13.5	13	2	94.5	84.5	104.5	99.5
250	11.5	10.5	9.5	2	96.5	86.5	106.5	101.5
315	8.5	7	6	2	93.5	83.5	103.5	98.5
400	6	3.5	2.5	2	96	86	106	101
500	4.5	1.5	0	2	94.5	84.5	104.5	99.5
630	3	-0.5	-2	2	93	83	103	98
750	2.5	-1	-2.5	2	92.5	82.5	102.5	97.5
800	2	-1.5	-3	2	92	87	107	102
1000	2.5	-1.5	-3	2	92.5	82.5	102.5	97.5
1250	3.5	-0.5	-2.5	2	93.5	83.5	103.5	98.5
1500	2.5	-1	-2.5	2	92.5	82.5	102.5	97.5
1600	1.5	-2	-3	2	96.5	86.5	106.5	101.5
2000	-1.5	-4.5	-3.5	2	93.5	83.5	103.5	98.5
2500	-4	-7.5	-6	2	91	81	101	96
3000	-6	-11	-8.5	2	94	84	104	94
3150	-6	-11	-8	2	94	84	104	94
4000	-5.5	-9.5	-5	2	94.5	84.5	104.5	99.5
5000	-1.5	-7.5	-5.5	2	93.5	83.5	108.5	98.5
6000	4.5	-3	-5	2	94.5	84.5	104.5	99.5
6300	6	-1.5	-4	2	96	86	106	96
8000	12.5	7	4	2	87.5	72.5	92.5	87.5
WhiteNoise	0	-4	-5.5	2		90		100

ANSI Free Field

ANSI S3.6-2010					Free Field max SPL	
					Free Field max HL is found by subtracting the selected RETSPL value	
	Binaural			Binaural to Monaural	Free Field Power	Free Field Line
	0°	45°	90°	correction	0° - 45° - 90°	0° - 45° - 90°
	RETSPL	RETSPL	RETSPL	RETSPL	Max SPL	Max SPL
Speech	15	11	9.5	2	90	100
Speech Noise	15	11	9.5	2	85	100
Speech WN	17.5	13.5	12	2	87.5	97.5

IEC Free Field

ISO 389-7 2005					Free Field max SPL	
					Free Field max HL is found by subtracting the selected RETSPL value	
	Binaural			Binaural to Monaural	Free Field Power	Free Field Line
	0°	45°	90°	correction	0° - 45° - 90°	0° - 45° - 90°
	RETSPL	RETSPL	RETSPL	RETSPL	Max SPL	Max SPL
Speech	0	-4	-5.5	2	90	100
Speech Noise	0	-4	-5.5	2	85	100
Speech WN	2.5	-1.5	-3	2	87.5	97.5

AC40 RETSPL-HL Tabel

Sweden Free Field						
ISO 389-7 2005					Free Field max SPL Free Field max HL is found by subtracting the selected RETSPL value	
	Binaural			Binaural to Monaural	Free Field Power	Free Field Line
	0°	45°	90°	correction	0° - 45° - 90°	0° - 45° - 90°
	RETSPL	RETSPL	RETSPL	RETSPL	Max SPL	Max SPL
Speech	0	-4	-5.5	2	90	100
Speech WN	2.5	-1.5	-3	2	87.5	97.5

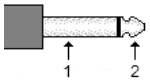
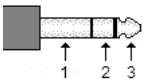
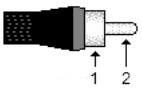
Norway Free Field						
ISO 389-7 2005					Free Field max SPL Free Field max HL is found by subtracting the selected RETSPL value	
	Binaural			Binaural to Monaural	Free Field Power	Free Field Line
	0°	45°	90°	correction	0° - 45° - 90°	0° - 45° - 90°
	RETSPL	RETSPL	RETSPL	RETSPL	Max SPL	Max SPL
Speech	0	-4	-5.5	2	90	100
Speech Noise	0	-4	-5.5	2	85	100
Speech WN	2.5	-1.5	-3	2	87.5	97.5

Equivalent Free Field					
Speech Audiometer					
	TDH39	DD45	HDA280	HDA200	HDA300
	IEC60645-2 1997 ANSI S3.6-2010	PTB – DTU 2010	PTB	ISO389-8 2004	PTB 2013
Coupler	IEC60318-3	IEC60318-3	IEC60318-3	IEC60318-1	IEC60318-1
Frequency	G_F-G_C	G_F-G_C	G_F-G_C	G_F-G_C	G_F-G_C
125	-17,5	-21.5	-15,0	-5,0	-12.0
160	-14,5	-17.5	-14,0	-4,5	-11.5
200	-12,0	-14.5	-12,5	-4,5	-11.5
250	-9,5	-12.0	-11,5	-4,5	-11.5
315	-6,5	-9.5	-10,0	-5,0	-11.0
400	-3,5	-7.0	-9,0	-5,5	-10.0
500	-5,0	-7.0	-8,0	-2,5	-7.5
630	0,0	-6.5	-8,5	-2,5	-5.0
750			-5,0		
800	-0,5	-4.0	-4,5	-3,0	-3.0
1000	-0,5	-3.5	-6,5	-3,5	-1.0
1250	-1,0	-3.5	-11,5	-2,0	0.0
1500			-12,5		
1600	-4,0	-7.0	-12,5	-5,5	-0.5
2000	-6,0	-7.0	-9,5	-5,0	-2.0
2500	-7,0	-9.5	-7.0	-6,0	-3.0
3000			-10,5		
3150	-10,5	-12.0	-10,0	-7,0	-6.0
4000	-10,5	-8.0	-14,5	-13,0	-4.5
5000	-11,0	-8.5	-12,5	-14,5	-10.5
6000			-14,5		
6300	-10,5	-9.0	-15,5	-11,0	-7.0
8000	+1,5	-1.5	-9,0	-8,5	-10.0

Sound attenuation values for earphones				
Frequency	Attenuation			
[Hz]	TDH39/DD45 with MX41/AR or PN 51 Cushion [dB]*	EAR 3A IP30 EAR 5A [dB]*	HDA200 [dB]*	HDA300 [dB]
125	3	33	15	12.5
160	4	34	15	
200	5	35	16	
250	5	36	16	12.7
315	5	37	18	
400	6	37	20	
500	7	38	23	9.4
630	9	37	25	
750	-			
800	11	37	27	
1000	15	37	29	12.8
1250	18	35	30	
1500	-			
1600	21	34	31	
2000	26	33	32	15.1
2500	28	35	37	
3000	-			
3150	31	37	41	
4000	32	40	46	28.8
5000	29	41	45	
6000	-			
6300	26	42	45	
8000	24	43	44	26.2

*ISO 8253-1 2010

5.3 AC40 Pin assignment

Socket	Connector	Pin 1	Pin 2	Pin 3
Mains	IEC C13	Live	Neutral	Earth
Left, Right **Ins. Left, Ins. Right** **HF Left, HF Right** **Bone 1, Bone 2** **Ins. Mask.**	 6.3mm Mono	Ground	Signal	-
TB **Mic. 1/Int. TF (goose neck)** **Mic. 2**		Ground	DC bias	Signal
Ass. Mon.		Ground	Signal 1	Signal 2
HLS		Ground	Right	Left
Pat. Resp. 1 & 2	6.3mm Stereo	-		
CD		Ground	CD2	CD1
Monitor (side panel)		Ground	Signal 1	Signal 2
Mic. 1/Ext. TF (side panel)		Ground	DC bias	Signal
CTRL	3.5mm Stereo	Ground	-	CTRL Signal
FF1 & FF2 FF3 & FF4	 RCA	Ground	Signal	-
FF1 & FF2 **FF3 & FF4**	Terminal Block	Black Loudspeaker Signal Negative	Red Loudspeaker Signal Positive	-

5.4 Electromagnetic Compatibility (EMC)

Portable and mobile RF communications equipment can affect the ***AC40*** . Install and operate the ***AC40*** according to the EMC information presented in this chapter.
The ***AC40*** has been tested for EMC emissions and immunity as a standalone ***AC40*** . Do not use the ***AC40*** adjacent to or stacked with other electronic equipment. If adjacent or stacked use is necessary, the user should verify normal operation in the configuration.
The use of accessories, transducers and cables other than those specified, with the exception of servicing parts sold by Interacoustics as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of the device.
Anyone connecting additional equipment is responsible for making sure the system complies with the IEC 60601-1-2 standard.

Guidance and manufacturer's declaration - electromagnetic emissions		
The *AC40* is intended for use in the electromagnetic environment specified below. The customer or the user of the *AC40* should assure that it is used in such an environment.		
Emissions Test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The ***AC40*** 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 B	The ***AC40*** is suitable for use in all commercial, industrial, business, and residential environments.
Harmonic emissions IEC 61000-3-2	Complies Class A Category	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Recommended separation distances between portable and mobile RF communications equipment and the *AC40* .			
The ***AC40*** is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the ***AC40*** can help prevent electromagnetic interferences by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ***AC40*** as recommended below, according to the maximum output power of the communications equipment.			
Rated Maximum output power of transmitter [W]	**Separation distance according to frequency of transmitter [m]**		
	150 kHz to 80 MHz $d = 1.17\sqrt{P}$	80 MHz to 800 MHz $d = 1.17\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.23\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.70	3.70	7.37
100	11.70	11.70	23.30
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 higher frequency range applies. **Note 2** These guidelines may not apply to all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

Guidance and Manufacturer's Declaration - Electromagnetic Immunity			
The ***AC40*** is intended for use in the electromagnetic environment specified below. The customer or the user of the ***AC40*** should assure that it is used in such an environment.			
Immunity Test	**IEC 60601 Test level**	**Compliance**	**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 greater than 30%.
Electrical fast transient/burst IEC61000-4-4	+2 kV for power supply lines +1 kV for input/output lines	+2 kV for power supply lines +1 kV for input/output lines	Mains power quality should be that of a typical commercial or residential environment.
Surge IEC 61000-4-5	+1 kV differential mode +2 kV common mode	+1 kV differential mode +2 kV common mode	Mains power quality should be that of a typical commercial or residential environment.
Voltage dips, short interruptions and voltage variations on power supply lines IEC 61000-4-11	< 5% *U*T (>95% dip in *U*T) for 0.5 cycle 40% *U*T (60% dip in *U*T) for 5 cycles 70% *U*T (30% dip in *U*T) for 25 cycles <5% *U*T (>95% dip in *U*T) for 5 sec	< 5% *U*T (>95% dip in *U*T) for 0.5 cycle 40% *U*T (60% dip in *U*T) for 5 cycles 70% *U*T (30% dip in *U*T) for 25 cycles <5% *U*T	Mains power quality should be that of a typical commercial or residential environment. If the user of the ***AC40*** requires continued operation during power mains interruptions, it is recommended that the ***AC40*** be powered from an uninterruptable power supply or its battery.

Power frequency (50/60 Hz) 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 residential environment.
Note: *U*T is the A.C. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration — electromagnetic immunity			
The ***AC40*** is intended for use in the electromagnetic environment specified below. The customer or the user of the ***AC40*** should assure that it is used in such an environment,			
Immunity test	IEC / EN 60601 test level	Compliance level	Electromagnetic environment – guidance
Conducted RF IEC / EN 61000-4-6 Radiated RF IEC / EN 61000-4-3	3 Vrms 150kHz to 80 MHz 3 V/m 80 MHz to 2,5 GHz	3 Vrms 3 V/m	Portable and mobile RF communications equipment should be used no closer to any parts of the ***AC40*** , including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1{,}2\sqrt{P}$ $d = 1{,}2\sqrt{P}$ 80 MHz to 800 MHz $d = 2{,}3\sqrt{P}$ 800 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 meters (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 the following symbol:
NOTE1 At 80 MHz and 800 MHz, 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)] 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 the ***AC40*** is used exceeds the applicable RF compliance level above, the ***AC40*** should be observed to verify normal operation, If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ***AC40*** . [(b)] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Return Report – Form 001

Opr. dato:	*af:*	*Rev. dato:*	*af:*	*Rev. nr.:*
2014-03-07	EC		MSt	4

Address

7625 Golden Triangle Drive Eden Prairie
MN 55344
USA

Phone
(+1) 800 947 6334

Fax
(+1) 952 903 4200

E-mail
rmd@interacoustics-us.com

Company: _____

Address: _____

_____

Phone: _____

Fax or e-mail: _____

Contact person: _____ Date : _____

Following item is reported to be:

☐ returned to INTERACOUSTICS for: ☐ repair, ☐ exchange, ☐ other: _____

☐ defective as described below with request of assistance

☐ repaired locally as described below

☐ showing general problems as described below

Item: Type: Quantity:

_____ _____

Serial No.: _____ Supplied by: _____

Included parts: _____

Important! - Accessories used together with the item must be included if returned (e.g. external power supply, headsets, transducers and couplers).

Description of problem or the performed local repair:

_____

_____

_____

Returned according to agreement with: ☐ Interacoustics, ☐ Other : _____

Date : _____ Person : _____

Please provide e-mail address or fax No. to whom Interacoustics may confirm reception of the returned goods:

_____

☐ **The above mentioned item is reported to be dangerous to patient or user** [1]

In order to ensure instant and effective treatment of returned goods, it is important that this form is filled in and placed together with the item.
Please note that the goods must be carefully packed, preferably in original packing, in order to avoid damage during transport. (Packing material may be ordered from Interacoustics)

[1] EC Medical Device Directive rules require immediate report to be sent, if the device by malfunction deterioration of performance or characteristics and/or by inadequacy in labelling or instructions for use, has caused or could have caused death or serious deterioration of health to patient or user.