

MedRx.

TRAINING

MANUAL



*Audiometry & Binaural
REM/LSM in One System*

**AVANT™
ARC**



www.medrx-usa.com

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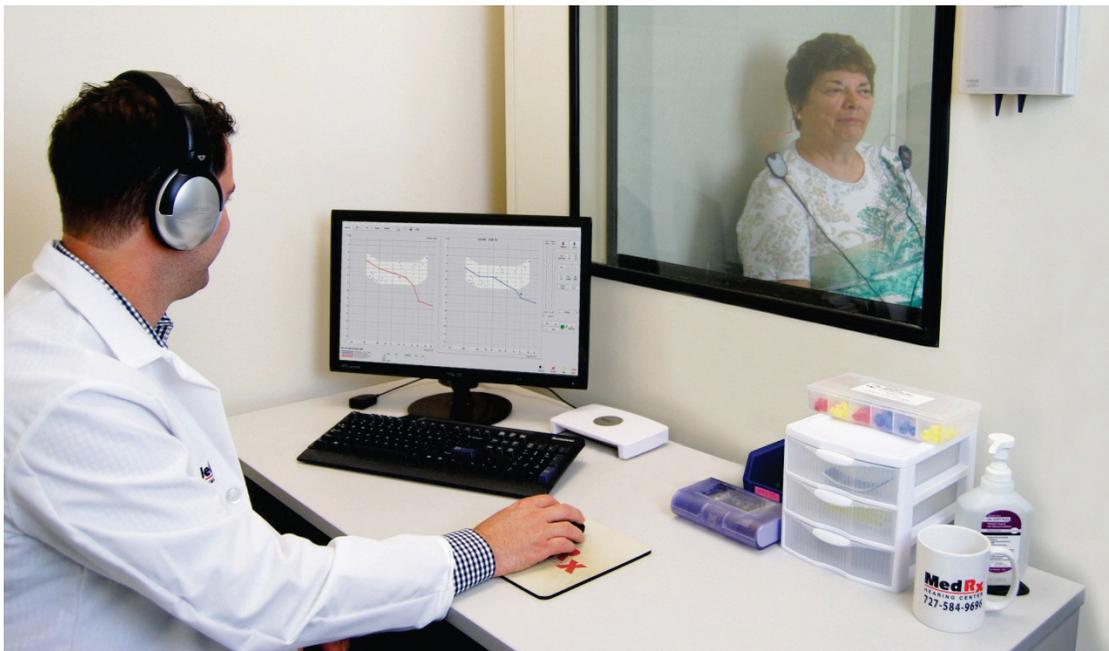
Introduction

The AVANT ARC (Audiometer and Real Ear Measurement Combination) represents a new era of ultra-compact diagnostic audiometry and precision in-situ verification for your office. Compact yet rugged, this PC-Based system is USB powered and supports current ANSI and IEC audiometric and Real Ear tests. The software includes targets for DSL v5.0 and NAL-NL2. A unique feature of the Real Ear Measurement System is simultaneous, binaural Live Speech Mapping, MedRx's in-situ method for getting the fitting right the *first time, every time*. The device performs Real Ear Measurements where measurements are performed directly on the client's ear. These measurements can be done with or without a hearing instrument being in place. The reason to perform Real Ear Measurements for hearing instrument fittings is that shape and size of an ear canal significantly influence a hearing instrument's performance. Knowing the sound intensity outside and inside the ear enables the practitioner to determine the actual amplification and output that the patient receives through the hearing aid and make the appropriate adjustments.

This manual assumes that the system hardware, software and drivers are installed and working properly. Please refer to the MedRx AVANT ARC Installation Manual for assistance. The Installation Manual is included in the original AVANT ARC packaging in both printed and PDF formats.

The scope of this manual is to get you "up and running" with the AVANT ARC System. Please consult the interactive Help System within the software for more detailed information of features and functionality. To access this tool, press the **F1 key** at any time, or click the **Help** icon or **text menu** with your mouse. Access these by clicking on the "Help" tab at the top of the screen, and select "Help Topics". Select an item from the list in the Index tab and click "Display".

Also refer to the Help files for test signal characteristics, analysis, equalization methods and the effects of analyzer settings on accuracy.



The AVANT ARC Software Overview

The AVANT ARC Software can run stand-alone or through the NOAH™ System or the TIMS® Office System.

Launching the Software

Stand Alone



1. Double Click the **AVANT AUD** or **AVANT REM** shortcut on your Windows Desktop.

NOAH and TIMS

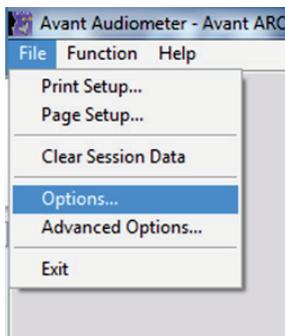
1. Launch **NOAH**.
2. Select Client.
3. In NOAH 4:
 - Click **AVANT AUDIOMETER** or **AVANT REM** icon on the toolbar.



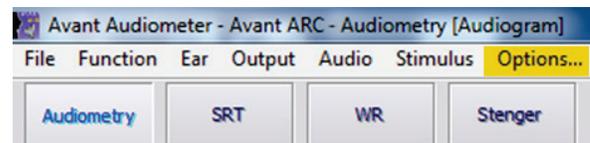
Basic Audiometer Software Options

Several option screens are available which allow the user to customize the AVANT ARC Audiometer Software to meet their needs.

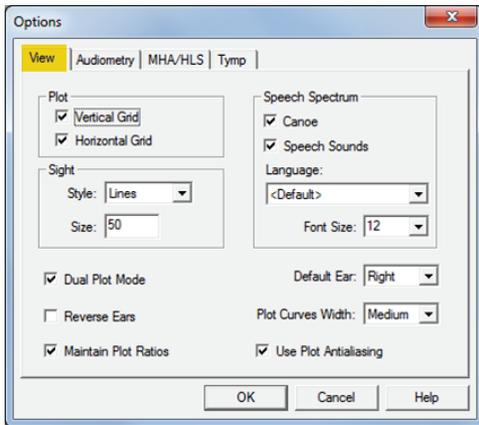
Access these **Options** from the **File Menu** on the AVANT ARC's Audiometer Main Screen as shown below.



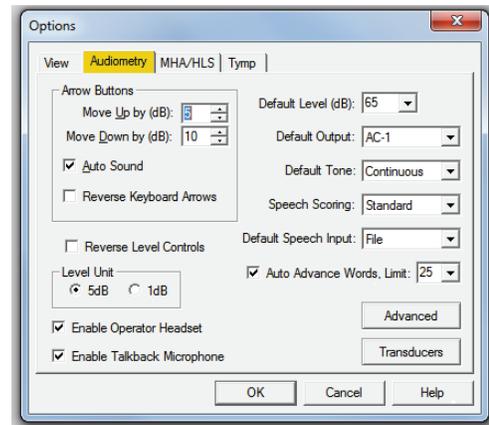
The Options may also be accessed from the Audiometry screen by clicking **Options** on the menu as shown below.



The screen shots below detail the **Basic Options** available.



The **View tab** allows you to set the default appearance of the test screen.

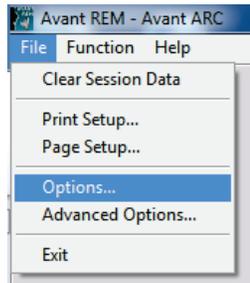


The **Audiometry tab** sets the look and behavior of the AVANT ARC Audiometer.

Basic REM (Real Ear Measurement) Software Options

Several option screens are available which allow the user to customize the AVANT ARC REM Software to meet their needs.

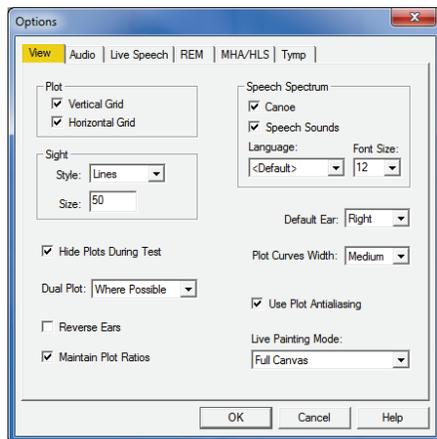
Access these **Options** from the **File Menu** on the AVANT ARC's REM Main Screen as shown below.



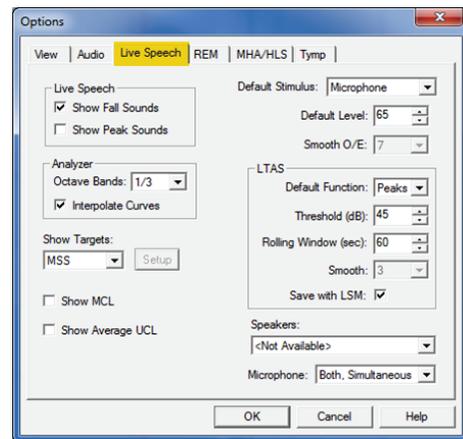
The Options may also be accessed from within the Avant REM audio screen by clicking on the **Options** text menu as shown below.



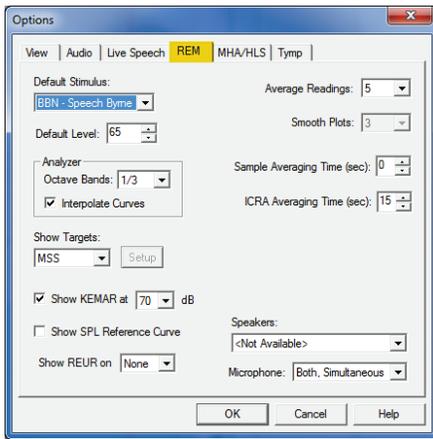
The screen shots below detail the **Basic Options** available.



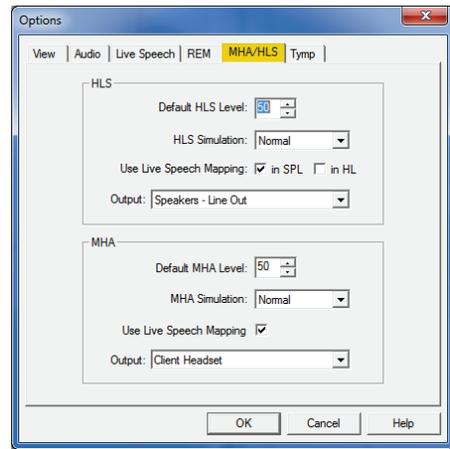
The **View tab** allows you to set the default appearance of the REM test environment. Defaults can be changed by using the check boxes and pull-down menus shown above.



The **Live Speech tab** sets the look and behavior of the Live Speech Mapping function. Use the Show Targets pull-down to change to DSL 5.0 or NAL- NL2 targets.



The **REM** tab sets the default look and behavior of conventional Real Ear Measurements.

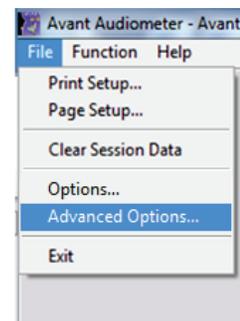
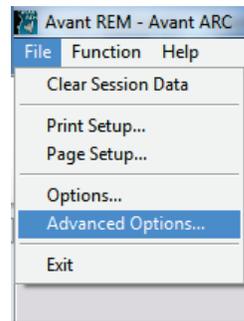


The **MHA/HLS** tab sets the default look and behavior of the Master Hearing Aid and Hearing Loss Simulator.

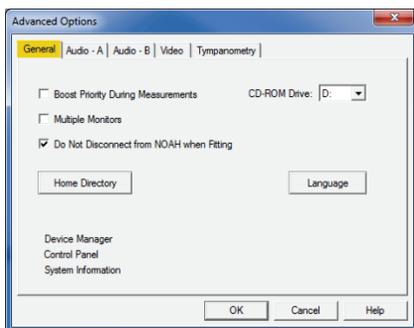
NOTE: Remember, that more information is always available in the Interactive Help System by clicking the Help Icon or pressing the F1 key.

Advanced Options

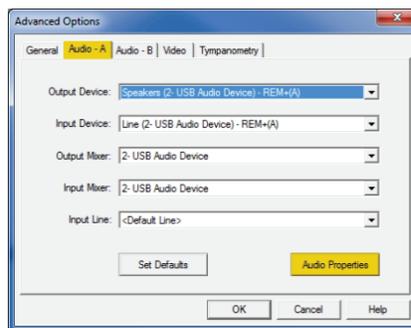
The **Advanced Options** screen allows you to configure your system to meet your individual clinical needs. It also provides MedRx Technical Support with tools for helping you troubleshoot technical issues. Access this screen from the File Menu on the AVANT ARC's REM or Audiometer Main Screen as shown to the right.



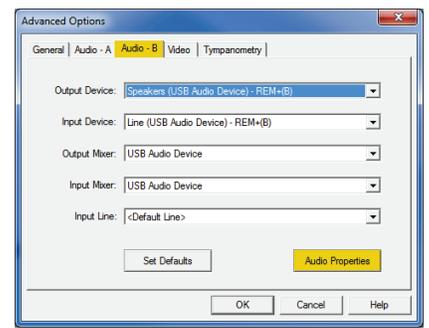
The key features of each tab are described below. For more in-depth information, consult the interactive Help system within the software by pressing the F1 key or clicking the Help icon.



The **General Tab** configures the overall Avant ARC behavior with respect to other Windows programs, specifically NOAH.

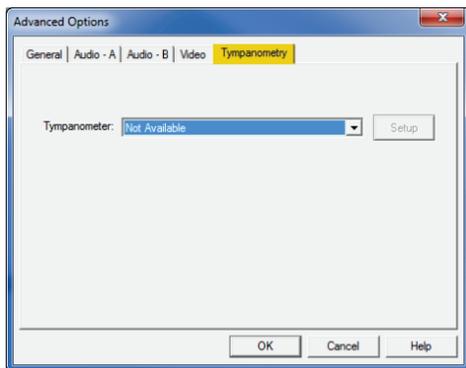


Use the **Audio-A** Tab to select the proper audio device for your Avant ARC. This tab also provides access to the **Windows Audio controls**.

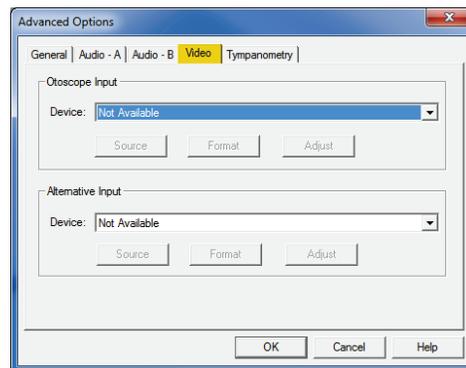


Use the **Audio-B** Tab to select the proper audio device for your AVANT ARC. This tab also provides access to the **Windows Audio controls**.

NOTE: The device settings may vary with different computers. Consult technical support before changing.



If your system has a **Tympanometer** connected, use the Tympanometry tab to configure the equipment according to the manufacturer's instructions.



If your system has a **Video Otoscope**, the Video Tab allows you to select the appropriate input device.

ARC Accessories

Use the accessories provided with your Avant ARC. Typical acceptable transducers are shown on the "Connecting the Peripherals" page in the training manual. Operator headsets for use with the Avant ARC should have 32 ohms impedance and the speaker power should be at least 50 watts. Air conduction transducers for use with this device should have an impedance of 10 ohms. The speaker voltage should match the local outlet power where the device is used.

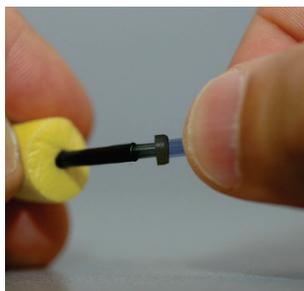
The Operator Headset with microphone is used by the operator to communicate with the patient. The patient talks to the operator using the Talk-Back microphone. 

Placing the Earphones on the Patient

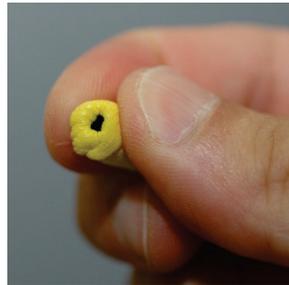
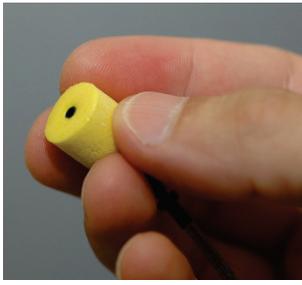
The AVANT ARC Audiometer standard configuration includes IP30 Insert Earphones. 3A Insert Earphones, DD45 or TDH 39 earphones are also available by request. The figures below illustrate how to properly place these earphones on the patient.

Insert Earphones

IMPORTANT: The foam tips used for the insert earphones are for SINGLE PATIENT USE ONLY. Do not attempt to wash and re-use them.

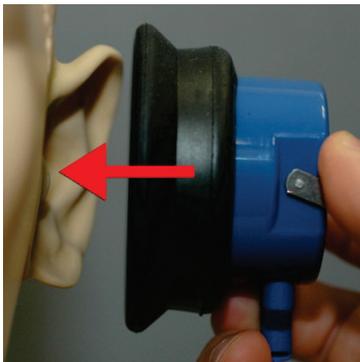


1. Place a new set of foam tips on the earphone tubes as shown. These tips are designed for single patient use and should not be washed and reused.
 - **NOTE: When removing foam tips after use, be sure the clear plastic tubing nipple remains attached to the long earphone tube.**



2. Carefully compress the tip between your fingers to allow it to fit into the patient's ear canal as shown. Do not roll the tip between your fingers.
3. Pull up and back on the patient's pinna to straighten the ear canal.
4. Place the compressed foam tip deep within the ear canal.
5. When properly placed, the outer surface of the insert tip will be flush with the opening of the ear canal as shown.

DD45 or TDH 39 Earphones



1. Place the earphones on the patient's head so the center of the earphone is directly over the opening of the ear canal.
2. Adjust the headband so the earphones remain in place, but be careful not to make it so tight as to cause patient discomfort.
- 3.

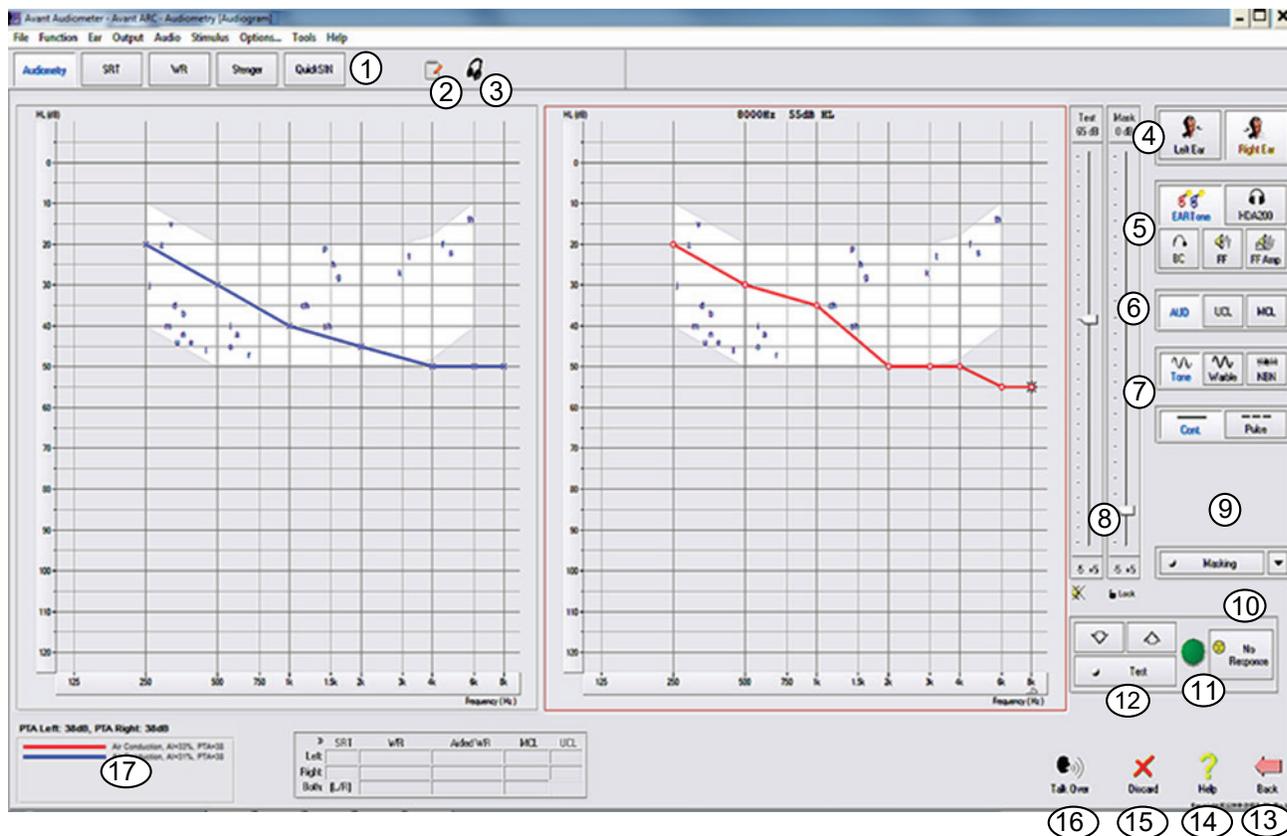
Placing the Bone Conductor



1. Locate the mastoid process behind the pinna. This is a bony prominence just behind where the ear meets the head.
2. Carefully place the bone conductor on the mastoid process and hold it in place.
3. Place the headband over the head to the opposite temple.
4. Carefully and slowly loosen your grip to check if the bone vibrator and headband will stay in place.
5. If either moves, reposition until both the headband and bone vibrator are secure.

Performing Audiometric Testing

From the AVANT ARC main screen, click on the “Audiometry” tab to access the audiometry function. The screen shot below shows the controls which are available from the AVANT ARC Audiometer main window. The sections of the manual that follow explain how to use these tools to perform hearing evaluations using your AVANT ARC Audiometer.



- | | |
|---|---------------------------------|
| 1. Test Selection Tool Bar | 12. Test Interrupter |
| 2. Journal or Notepad | 13. Back to the Main Screen |
| 3. Monitor Headset Control | 14. Help |
| 4. Ear Selection | 15. Discard Current Measurement |
| 5. Output selectors | 16. Talk Over |
| 6. Test Type Selectors | 17. Legend |
| 7. Tone Type Selectors | |
| 8. Output Level Potentiometers | |
| 9. Masking Interrupter and Routing Selector | |
| 10. No Response Button | |
| 11. Patient Response Indicator | |

To exit the program, click on the “Back” button then click “Exit”.

Pure Tone Audiometry

Pure Tone Audiometry measures the patient's peripheral hearing sensitivity, or the softest levels they can hear pure tones at a variety of frequencies. These thresholds are plotted on a standard graph called an audiogram. The AVANT ARC software controls the hardware, stores the data (if running within NOAH or TIMS) and prints a standard audiogram report. Pure tone Audiometry can be performed via earphones, free field speakers (Air Conduction) or a Bone Conductor (Bone Conduction). Warble settings are adjustable by the Operator. The Sound Field must be calibrated on-site, using 4 ohm speakers connected to the Free Field connectors.

Pretesting Procedures/Recommendations:

- Before performing audiometry, careful inspection of the ear canal should be performed. This is best done with Video Otoscopy. After ensuring the ear canal is clear, place the appropriate transducer on the patient as shown on pages 8 & 9.

Pure Tone Audiometry via Earphones (IP30 Inserts, 3A Inserts, DD45 or TDH 39)

1. From the Main Screen, click the  button on the right side menu bar.
2. By default, the  button will be selected once you enter the main Audiometry Screen.
Other default settings (based on typical clinical practice and procedures) are:
 - Right Ear
 - AC (Air Conduction)
 - Tone Stimulus
 - Continuous Tone
3. Instruct the patient that they will hear several very quiet (soft) tones (beeps) and that they should signal (raise their hand, press the patient response button, etc.) as soon as they hear it. It is helpful to also say "even if it seems very far away".
4. Begin at 1000 Hz in the Right ear (unless the patient reports better hearing in the left ear).
5. Present a tone at 60 dB by pressing and holding the space bar or clicking and holding the  button.
6. If the patient does not hear the tone (does not signal), raise the level 5 dB using the up arrow on your keyboard or by clicking the  button and present again.
7. Repeat step 6 until the patient signals that they hear the tone.
8. When the patient signals they hear the tone, decrease the level by 10 dB using the down arrow on your keyboard or by clicking the  button and present the tone again.
9. Repeat steps 6 through 8 until the patient responds to a tone at the same level 2 times with the level ascending and establishing a threshold.

10. Using the right arrow key, change the test frequency to 2000 Hz and repeat steps 5 through 9 to establish the threshold at 2000 Hz. The threshold at the previous frequency is recorded when the test frequency is changed.
 - **NOTE:** If the threshold at 2000 Hz is more than 20 dB different (less than or greater than) the threshold at 1000 Hz, repeat steps 5 through 9 at 1500 Hz (the “half octave” between 1000 Hz and 2000 Hz).
11. Repeat steps 5 through 9 for 4000 Hz, 8000 Hz, 500 Hz and 250 Hz. Testing half octaves as needed.
12. Repeat steps 4 through 11 in the opposite ear.

NOTE: The software automatically calculates the 3-frequency Pure Tone Average (PTA) which is displayed above and inside the legend as follows:

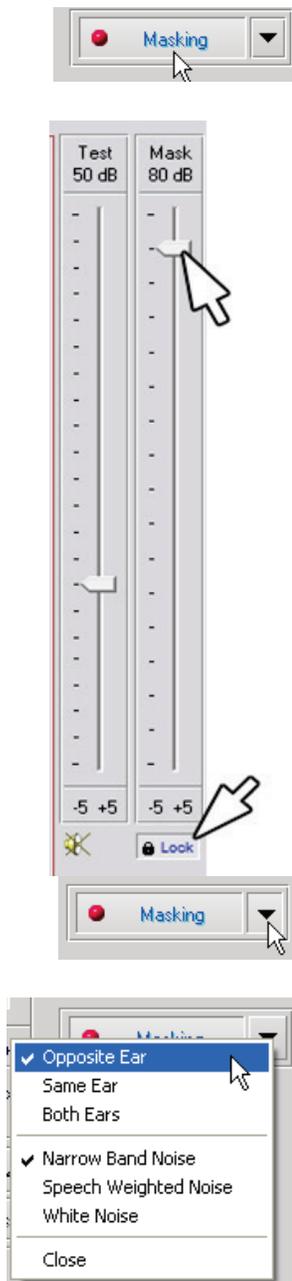


Pure Tone Audiometry via the Bone Conductor

1. Following the instructions on page 11, place the Bone Conductor on the mastoid process behind the ear with better air conduction thresholds as measured above. If the thresholds are equal, place the Bone Conductor on the mastoid process behind the right ear.
2. Establish pure tone bone conduction thresholds as described above for 1000 Hz, 2000 Hz, 4000 Hz, 500 Hz and 250 Hz.
3. If the Bone Conduction (BC) threshold at a given frequency is less (better) than the Air Conduction (AC) threshold by 15 dB or more, you must confirm the threshold by performing masking. Masking is always recommended for frequencies above 2000 Hz to achieve valid results.
4. Repeat steps 1-3 for opposite ear.

Masking for Pure Tone Audiometry

There are several accepted methods for masking. This manual will not promote one over another, however, to use the masking function on the AVANT Audiometer – Avant ARC, follow the steps below.



1. Click the **Masking** button. The red light will appear indicating that the masking is on.
2. Use your mouse to adjust the Masking Level slider shown on the left to the appropriate level based on your preferred method of masking.
3. If you wish to maintain the balance of signal and masking (for example, masking always 15 dB above the signal), click the **Lock** button after setting the masking and signal levels.
4. The default for pure tone audiometry is to deliver narrow band masking to the ear opposite the test ear. If you wish to use a different stimulus, or route the masking to the same or both ears, click on the **arrow** to the right of the Masking On button.
5. Use your mouse to select the new masking type and routing for your specific application.
6. When you are finished making changes to the Masking, click **Close**.

Speech Audiometry

Speech audiometry evaluates how well the patient can hear and understand speech. The typical test battery includes tests of speech thresholds and tests of speech discrimination.

The sections below detail how to perform these tests on the AVANT ARC Audiometer.

Speech Reception Threshold (SRT)

The Speech Reception Threshold (SRT) is defined as the lowest dB level at which the patient can repeat Spondee words with at least 50% accuracy. Spondee words are two syllable words with equal vocal emphasis on each syllable such as “baseball” or “hotdog”.

Instruct the patient that they will hear a series of two-syllable words that will get quieter as the test progresses. They are to repeat the words as best they can, even if they sound very far away. If they are not sure of a word, they should take a guess.

SRT is typically within +/- 5 dB of the patient’s PTA which is displayed on the lower left corner of the screen. Set the level of the test signal to “a level of familiarization”, done typically 20 dB above the PTA.



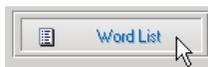
1. From the AVANT Audiometer main screen, click the **Audiometry** button.



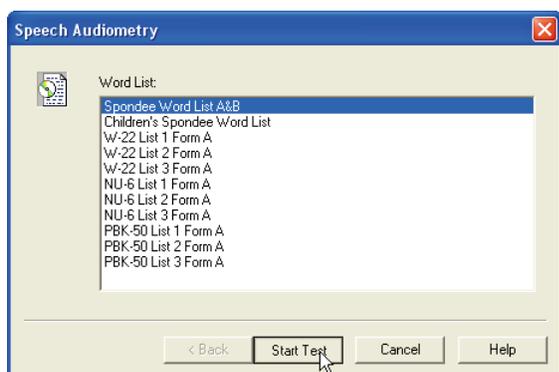
2. Click the **SRT** button located on the toolbar on the top of the screen.



3. Select the appropriate **test ear** icon.



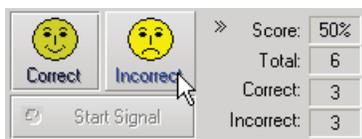
4. Click the **Word List** button.



5. Select **Spondee Word Lists A&B** from the list.
6. Click **Start Test**.



7. Click the **Play** button or press the F9 key to present a word. The word will play through the chosen transducer as well as display on the screen.



8. If the patient correctly repeats the word, click the **Correct** icon or press F7.
9. If the patient incorrectly repeats the word, click the **Incorrect** icon or press F8.

NOTE: that the score is calculated and displayed automatically in the bottom right corner of the screen.

If the patient exceeds a 50% score at a given presentation level, stop the test and decrease the level by 10 dB and repeat the steps above.

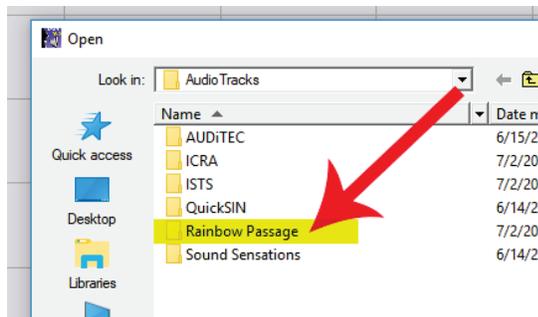
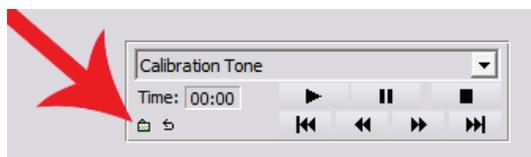
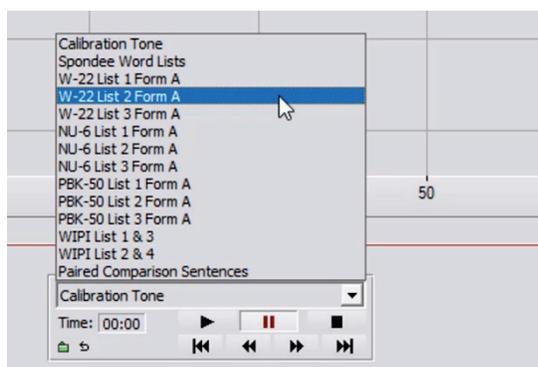
If the patient fails to achieve a 50% score after 6 words at a given level, stop the test, raise the level 5 dB and repeat the steps above.

When the patient scores 50% at a given level, the test is complete. The software automatically plots the score on the SRT graph.

Repeat test on opposite ear.

Speech MCL & Speech UCL

The patient's most Comfortable Level and Uncomfortable Level for speech can be obtained while you are in Work Recognition (WR).

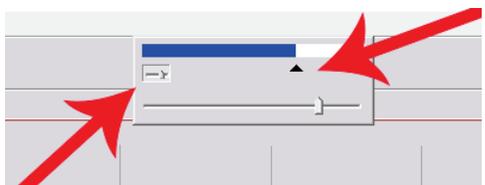
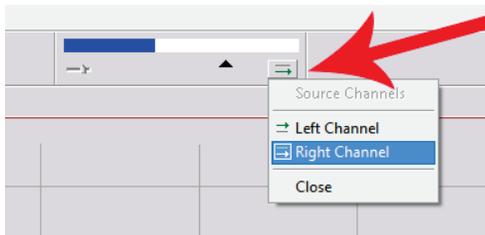
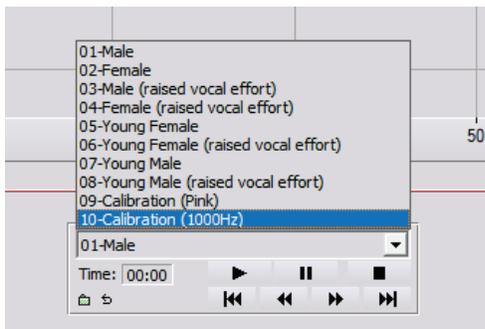


1. From the Avant main screen, Click the **Audiometry** button.
2. Click the **WR** button located on the toolbar on the top of the screen.
3. Click **UCL** or **MCL**.
4. Choose an input option.
5. If you selected **File** or **CD**, select the track you would like to play for the test in the media player at the bottom of the screen.

When you have selected your track in the media player, click play on media player or hit the spacebar to start.

Adjust levels up or down with keyboard arrows or by clicking below the dB level at the bottom of the graph.

6. To Input & Calibrate the Rainbow Passage in WR for MCL:
 - a. Press small Green file folder in bottom left of media player.
 - b. Select Rainbow Passage by double clicking twice.



- c. Use the drop down in the media player and select track 10 – Calibration (1000Hz).
- d. Click play or start signal.
- e. On the VU meter at the top of the screen, press the slider calibration icon just below and to the left of the VU meter.
- f. Adjust with mouse or arrow keys so that the blue bar stops over the black arrow and there is no red.
- g. Click on the channel icon just below and to the right of the VU to switch channels.
- h. Repeat steps d - f for the remaining channel.

Note: This calibration also needs to be done with any custom word list.

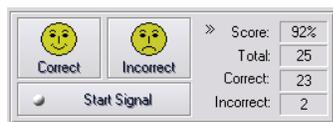
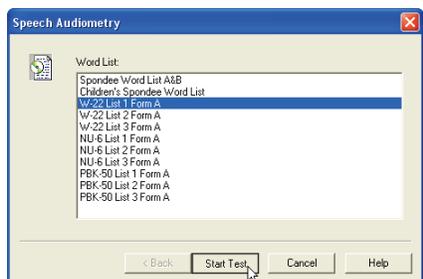
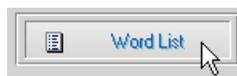
7. When using the **Mic** or live voice option make sure you press the **Start Signal** or space bar to begin.
8. When using the **Mic** option adjust your input using the slider so that it is peaking at the black triangle under the **VU meter**.

The **VU meter** is at the top of the MedRx Software and will become active once you press **Start Signal**.

Word Recognition (WR)

Speech Discrimination or Word Recognition (WR) is a discrimination type test using speech as the stimulus. WR testing measures the percentage of mono-syllable words repeated correctly from a list. Unlike the SRT test, the WR test is performed at a fixed intensity (dB) level. WR is typically performed at a patient's speech MCL. If MCL is not performed, system default options include, PTA, PTA+20, PTA+30 and PTA+40.

Before beginning the test, instruct the patient that they will hear a series of one-syllable words. They are to repeat the words as best they can. If they are not sure of a word, they should take a guess.



1. From the AVANT Audiometer main screen, click the **Audiometry** button.
2. Click the **WR** button located on the toolbar on the top of the screen.
3. Select the appropriate **test ear** icon.
4. Click the **Word List** button.
5. Select the desired Word List from the list. The W-22 or NU-6 lists are good choices for most adult patients. When testing children, the PBK lists should be used.
6. Click **Start Test**.
7. Click the **Play** button or press the F9 key to present a word. The word will play through the chosen transducer as well as display on the screen.
8. If the patient correctly repeats the word, click the **Correct** icon or press F7.
9. If the patient incorrectly repeats the word, click the **Incorrect** icon or press F8.
10. The next word will automatically play when the previously presented word is scored.

Note that the score is calculated and displayed automatically. The test is complete when all words in the list have been presented. The software automatically plots the score on the WR graph.

Repeat test on opposite ear.

QuickSIN (Optional)

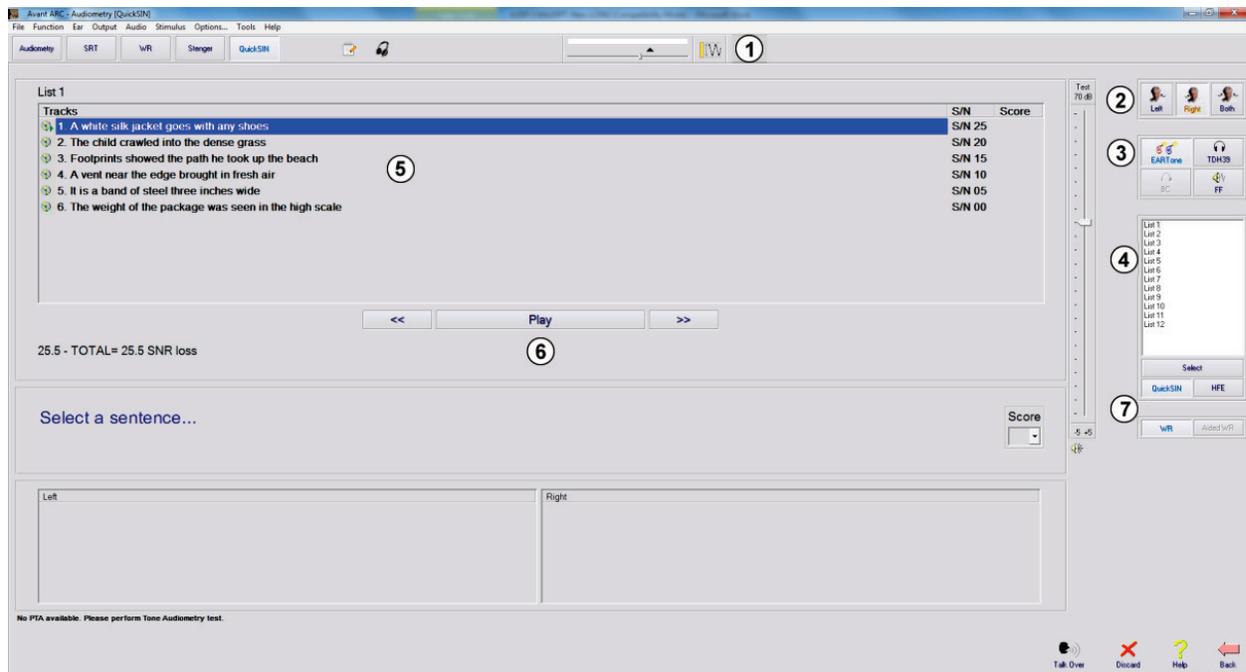
The primary complaint of hearing-impaired persons is difficulty hearing in background noise. The measurement of SNR loss (signal-to-noise ratio loss) is important because speech understanding in noise cannot be reliably predicted from the pure tone audiogram (Killion & Niquette, 2000).

The QuickSIN test was developed to:

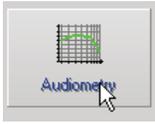
1. Provide a one-minute estimate of SNR loss.
2. Provide a quick way for clinicians to quantify a patient's ability to hear in noise.
3. Determine if extended high frequency emphasis improves or degrades understanding of speech in noise.
4. Assist professionals in choosing appropriate amplification and other assistive technologies.
5. Demonstrate that hearing aids with directional microphones improve speech intelligibility in noise.
6. Provide a large number of equivalent test lists for use in clinical and research work.
7. Provide information useful in counseling patients regarding realistic expectations.

The screenshot below shows the key features of the QuickSIN test.

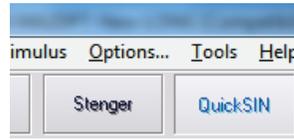
1. Calibration Button
2. Ear Selector
3. Output Selector
4. List Selector
5. Track Display
6. Track Control
7. Test Type Selector



Performing the QuickSIN Test



- From the Avant main screen, click the **Audiometry** icon.

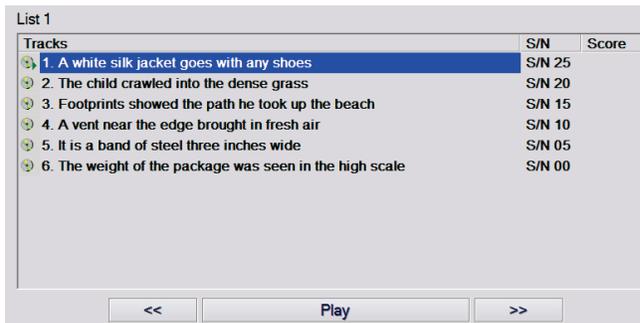


- Click the **QuickSIN** button on the top of the Audiometry screen.

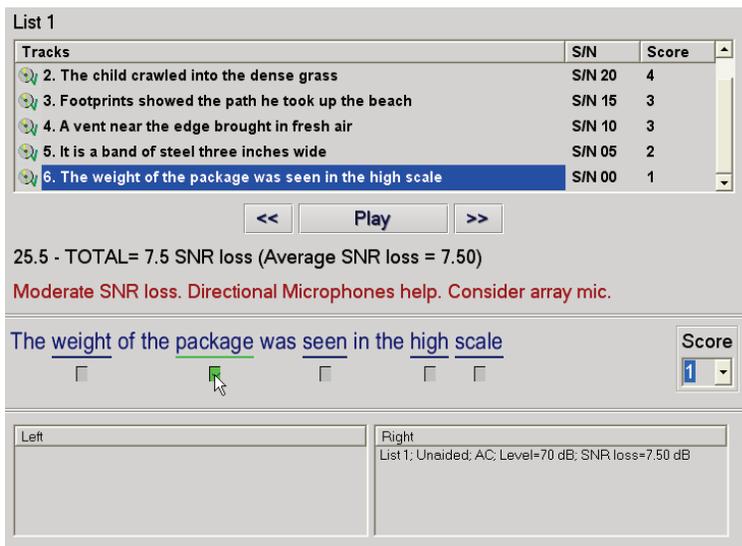
Present the test with earphones or in a sound field. The attenuator dial is set to 70 dB HL. For subjects with PTA hearing losses greater than 45 dB HL, the attenuator dial is set to a level that is "loud but OK.", this is done by the program using the MCL value. A warning legend at the bottom of the window is shown if PTA is not available. Instruct the patient to repeat the sentences spoken by the target (female) talker. When testing in a sound field, have the patient hold the talkback microphone close enough so that responses are clearly audible to the tester.



- Select a list from the List Selection Window one of the following two ways:
 - Click the **list**, then click **Select**.
 - Or Double-Click the list number.

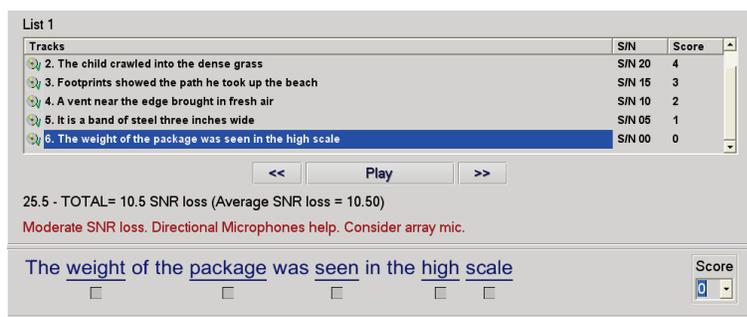


- Play the first sentence in the list by clicking the **Play** button. Ask the patient to repeat the sentence.



- Score the patient's response one of the following ways:
 - Click the **check-box** of each correct key word with your mouse. This will record the total number of correct key words in the score pull-down.
 - Record the total number of correct key words using the score pull-down or by pushing 1-5 key on the keyboard.
- Click the next sentence and then click **Play** or click >>. This will advance & play.

- Repeat steps 2-4 until all 6 sentences in the list have been played and scored.



After all six sentences are scored, the following results are displayed:

- Total SNR Loss in dB.
- Recommendations.

Additional information on interpreting the QuickSIN is available in the Interactive Help system. Top access this, click the **Help** icon or press the F1 key.

Tinnometer (Optional)

Purpose of the Tinnometer

Tinnitus is experienced by millions of people worldwide. The Tinnometer is designed to mimic the sounds of tinnitus in order to provide an accurate and flexible tinnitus assessment. Tinnitus Assessment increases patient rapport with the clinician when an equivalent tinnitus sound can be created. The Tinnometer can accurately create tinnitus sounds for fast and reliable tinnitus assessment. All test results should be used to help counsel the patient on their specific tinnitus and what the assessment has found.

The Tinnometer test was developed to:

- Break away from the traditional limitation of tinnitus assessment with an audiometer
- Produce accurate and flexible sounds that mimic patient tinnitus
- Provide extended frequency ranges to more accurately match tinnitus sounds
- Decrease the time needed to complete a tinnitus assessment
- Standardize reporting needed when completing tinnitus assessment
- Allow clinicians to save and recall prior tinnitus assessments
- Provide general guidelines for implementing results into tinnitus sound therapies provided by leading hearing aid manufacturers

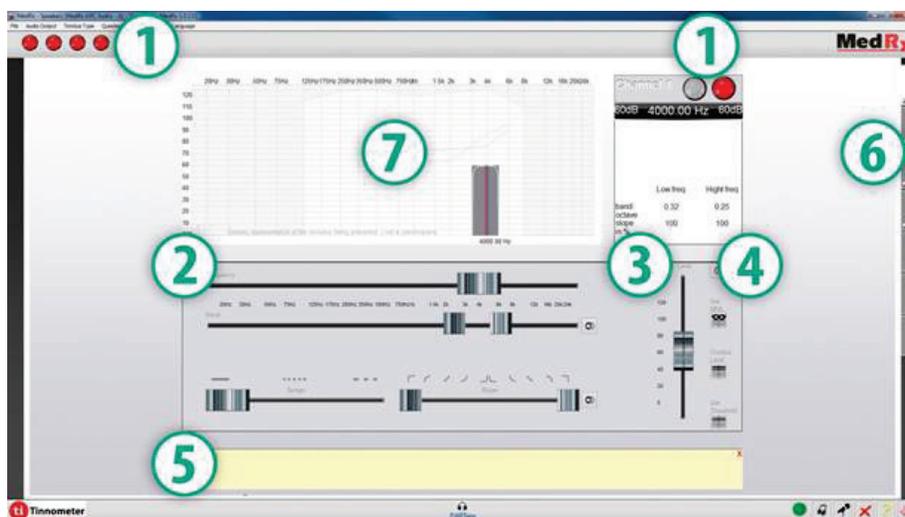
Performing the Tinnometer Testing:



- Click the **Tinnometer** button from the main Avant Audiometer main screen.

The following screenshot shows the key features of the Tinnometer:

1. Toggle Switch to Start/Stop stimulus
2. Sliders to control frequency, bandwidth, slope and tempo of the stimulus
3. Slider to control the intensity of the stimulus
4. Buttons used in determining tinnitus match, threshold and minimum masking level
5. Area where description of items will be displayed
6. Channels designed to present multiple types of tinnitus sounds
7. A graphical display of the sounds being played for the patient. Stimulus and Audiogram (if done within Avant or Noah) are display in dB SPL



Interactions with the patient are controlled as follows:

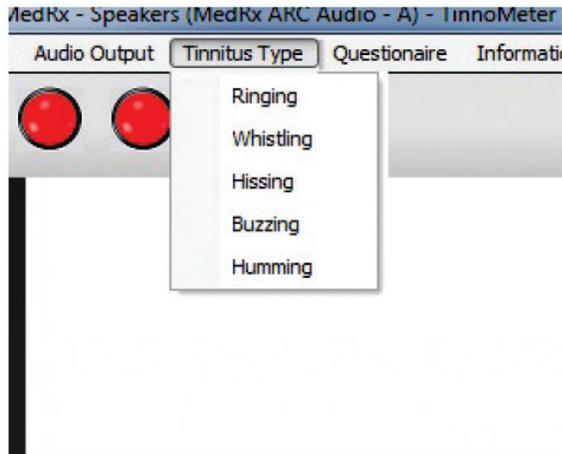


1. Patient response switch indicator
2. Patient monitor microphone
3. Talk forward
4. Undo
5. Toggle help section
6. Return to Avant

There are 3 Steps needed for Tinnitus Assessment with the Tinnometer

1. Identify patient's tinnitus by frequency, bandwidth, slope and tempo
2. Lower the identified tinnitus until patient threshold is reached
3. Raise the tinnitus level above the identified tinnitus intensity (widen bandwidth if needed) until the patient states they no longer hear the tinnitus. Play stimulus for 60 seconds to ensure masking is achieved.

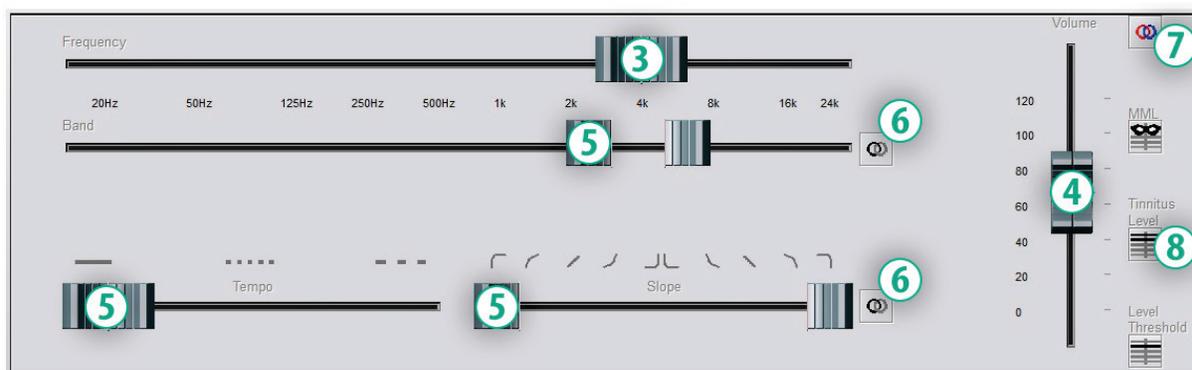
Step 1: Identify Patient's Tinnitus



1. Start by selecting the **tinnitus type** that has been described by the patient. This is an approximation of the tinnitus sound your patient hears. Tinnitus type will provide a starting frequency, bandwidth and slope to help speed up testing time.



2. Use the stimulus **start/stop toggle** to present the selected signal to the patient.



3. Use frequency slider to match the pitch of the patient's perceived tinnitus
4. Use volume slider to match patient's perceived intensity of tinnitus
5. Adjust bandwidth, slope and tempo (for pulsating tinnitus or prevention of adaptation) as needed
6. Buttons to allow greater flexibility in bandwidth and slope of tinnitus. Allows the addition of high/low frequency sounds independently
7. Allows for independent right/left volume control
8. Press Tinnitus Level button once the patient's tinnitus is matched

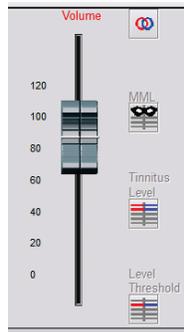
Step 2: Find Identified Tinnitus Threshold



1. Use **down** arrow on your keyboard to lower stimulus until patient states they are no longer able to hear the tinnitus.

2. Click **Threshold Level** button.

Step 3: Masking Tinnitus for 60 Seconds



1. Use **volume slider** to increase intensity of the stimulus until the patient states they are no longer able to hear their tinnitus.

NOTE: Lower levels of masking may be achieved by increasing bandwidth of the masking stimulus. Pulsating the masking noise can prevent tinnitus adaptation.

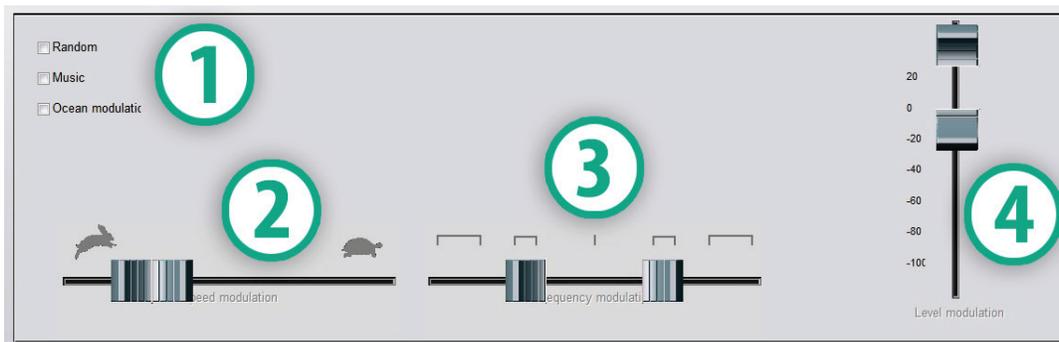


2. Press the **MML button** and continue presenting stimulus until 60 second countdown ends.

3. If patient begins to hear their tinnitus within the 60 seconds, raise intensity until masking is achieved and repeat number 2.

Tinnometer Modulation Tab

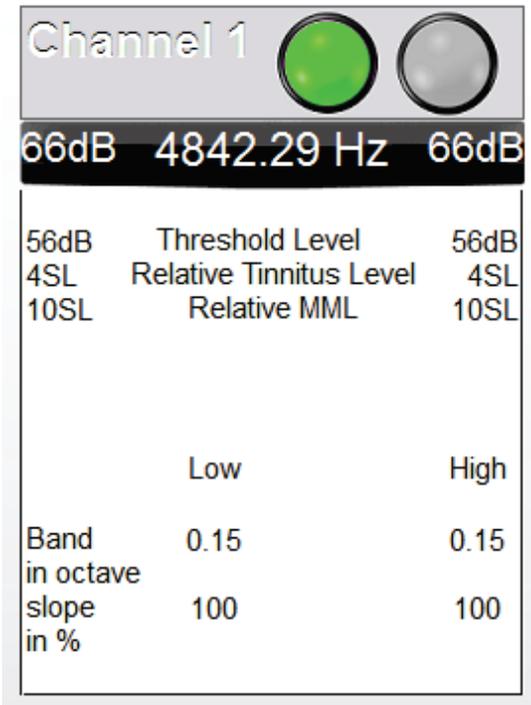
The Tinnometer modulation tab is designed to simulate sound generators when hearing aid demonstrations cannot be performed. The following are controls used in Modulation.



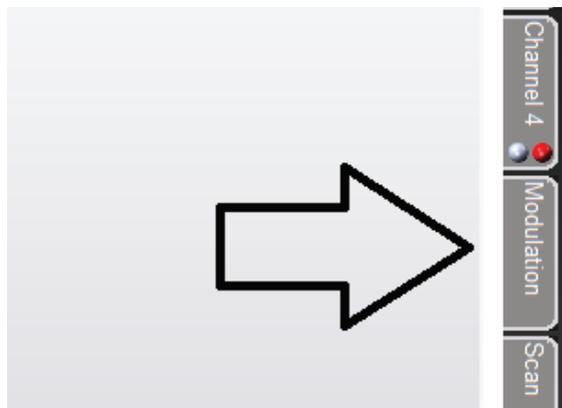
1. Type of modulation Sound
2. Speed of modulation

3. Frequency of modulation
4. Modulation volume range

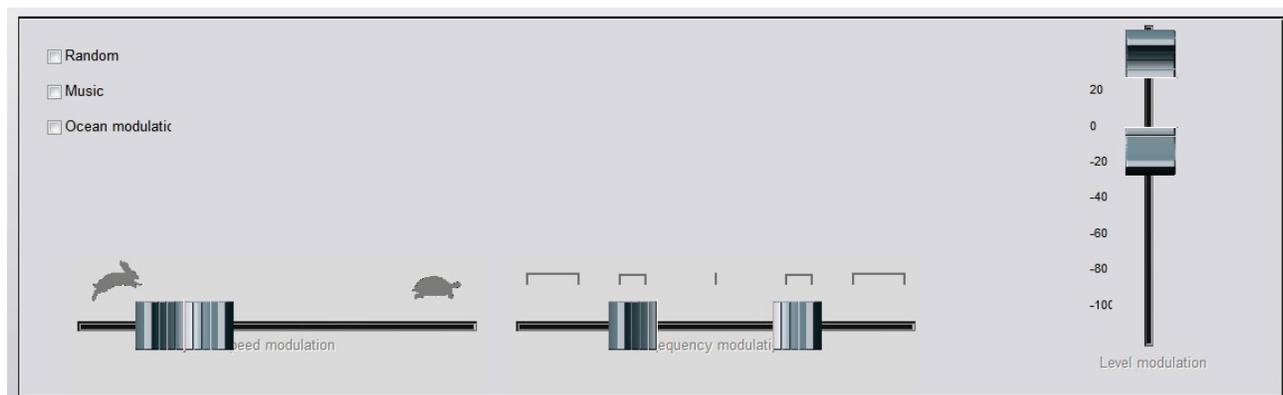
To use the Modulation features within Tinnometer, you must first complete the three steps involved with tinnitus assessment. Once tinnitus assessment is complete, you can use modulation by:



1. Activating the channel in which the tinnitus assessment was performed.



2. Enter the modulation tab on the right side of Tinnometer software.



3. Adjust the modulation stimulus with sliders as a counseling tool for the patient.

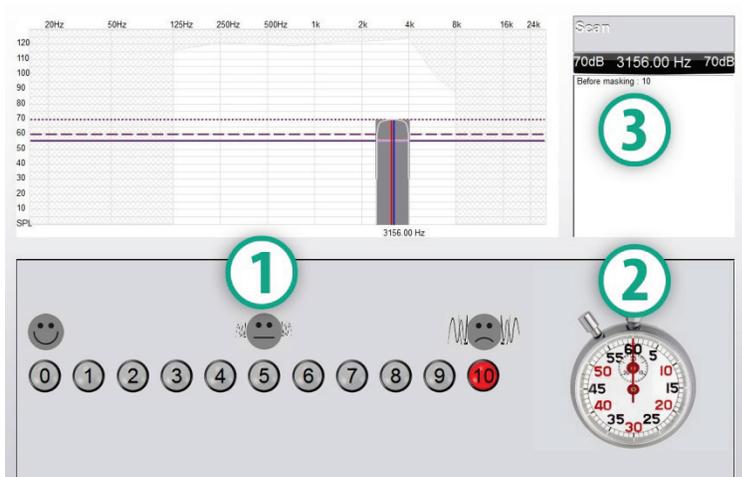
Tinnometer Audiometry Scan

The Tinnometer Scan tab is designed for various forms of air conduction audiometry. There are three types of audiometry that can be performed with Tinnometer. You can access the forms of audiometry with the buttons located by the number 1 in the image below.



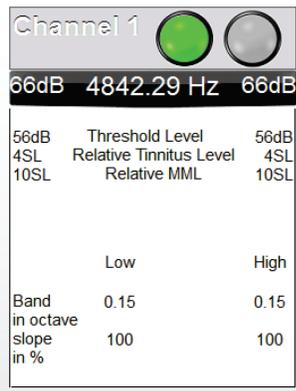
Tinnometer Residual Inhibition (RI)

The Tinnometer RI tab is designed for Residual Inhibition (RI) testing for a patient's tinnitus. The controls in the RI tab are as follows:

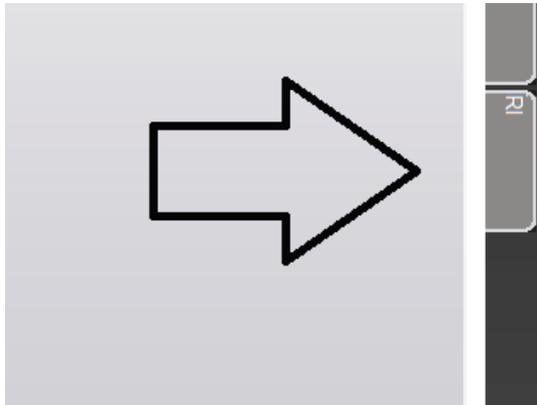


1. Scale from 0-10 of tinnitus bothersome level
2. Timer to begin stimulus
3. Tracking of patient's tinnitus bothersome level as a function of time

A complete tinnitus assessment must be performed prior to performing testing in the RI tab. Once tinnitus assessment testing is completed, optional residual inhibition testing can be performed with the following steps:



1. Activating the channel in which the tinnitus assessment was performed.



2. Select the RI tab on the right side of the Tinnometer software.



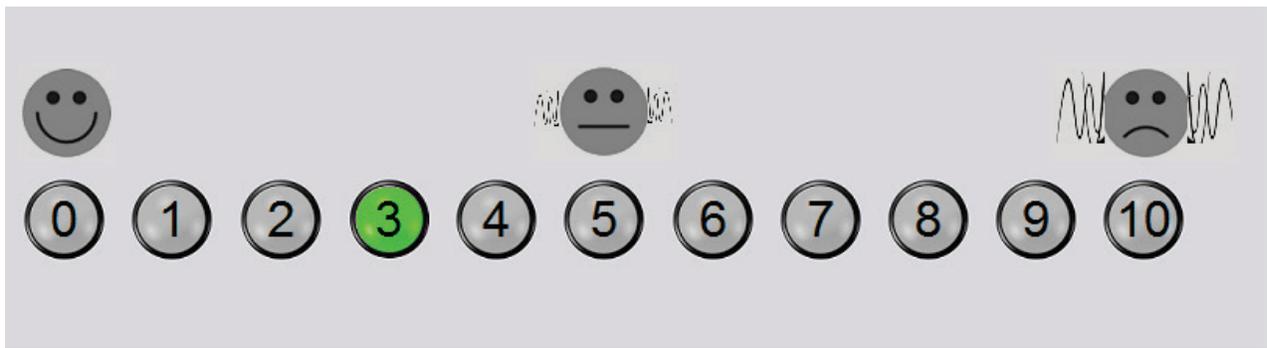
3. Ask the patient the bothersome level of their tinnitus from 1 to 10 and mark their response.



4. Click the stop watch to begin the masking stimulus (stimulus to play for 60 seconds).

You will hear a masking noise for 1 minute
 Then the noise will suddenly stop
 The patient will have to redefine his discomfort about every 30 seconds.

5. Stimulus will play for 60 seconds and automatically stop at the 60 second point.

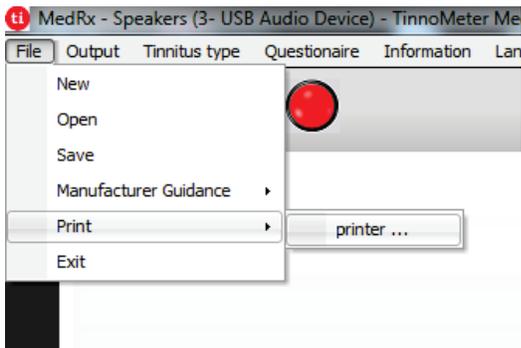


6. When the stimulus stops the patient must redefine their tinnitus bothersome level every 30 seconds. The bothersome level should decrease upon the stimulus stopping and will increase with time.
7. The test continues until the bothersome level returns to pre-test level.

Tinnometer Report Printing

The Tinnometer has four reports available for printing: tinnitus assessment report, manufacturer guidance report, questionnaire report and a channel report.

The following are common features found across reports:



1. To generate your report, select "printer ..." from the File menu.



2. Select the paper style you are printing.



3. Confirm all patient information is correct.



4. Choose your print preferences.



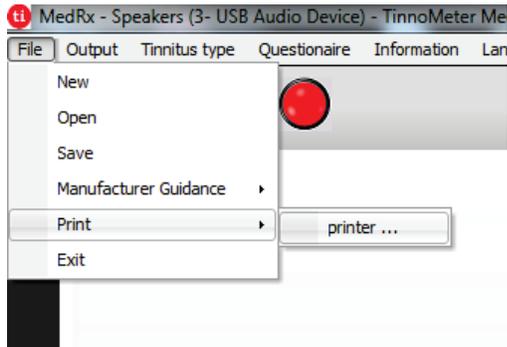
5. Change the zoom of your print preview.



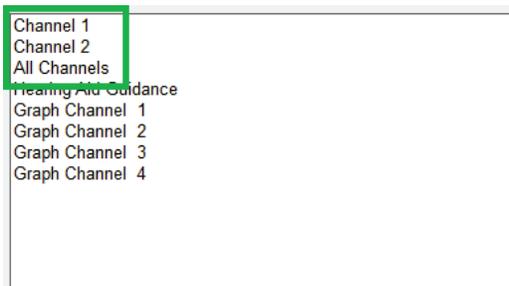
6. Print your Report.

Tinnitus Assessment Report

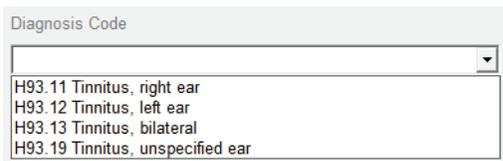
Tinnitus assessment reports are able to be generated after completing the three steps to tinnitus assessment. Once all steps are complete you are able to print a report



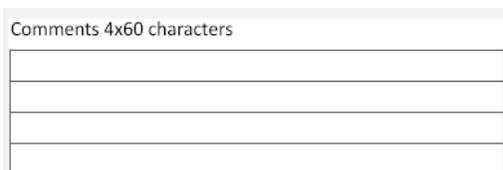
1. To generate your tinnitus assessment report, select "printer ..." from the File menu.



2. The "Channel" reports are the tinnitus assessment reports. Select the channel used for testing or All Channels when multi-channel testing is completed.



3. Use the drop down box to select a diagnosis for the patient.



4. Comments can be entered in 4 separate lines with a maximum of 60 characters.

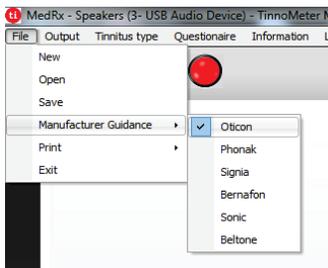


5. Print the Report.

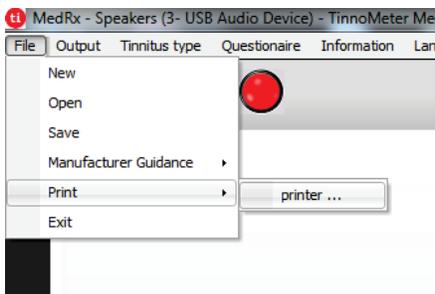
Manufacturer Guidance Report

Manufacturer guidance reports are designed to provide hearing aid sound therapy guidance to a clinician based on tinnitus assessment results. Sound therapy is an option to tinnitus treatment. We encourage all clinics to develop a tinnitus treatment protocol that is in line with their tinnitus treatment goals. Manufacturer guidance generated by the Tinnometer is designed to be a starting point in sound therapy and each patient may differ in preferred sound.

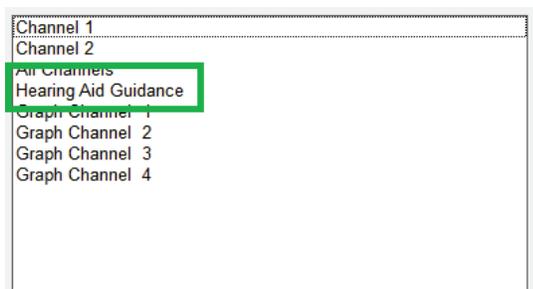
Manufacturer guidance reports are able to be generated after completing the three steps to tinnitus assessment. Once all three tinnitus assessment steps are complete you are able to print a report.



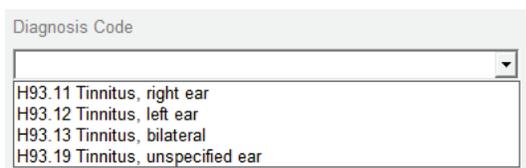
1. Select the manufacturer that you would like to have printed in your report.



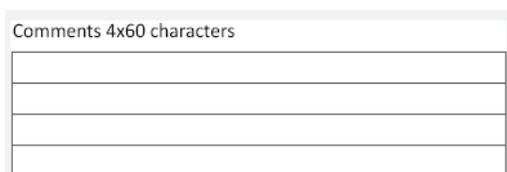
2. To generate your tinnitus assessment report, select "printer ..." from the File menu.



3. Select "Hearing Aid Guidance" from the list of reports.



4. Use the drop down box to select a diagnosis for the patient.



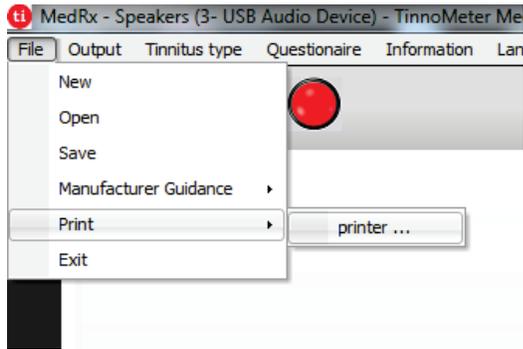
5. Comments can be entered in 4 separate lines with a maximum of 60 characters.



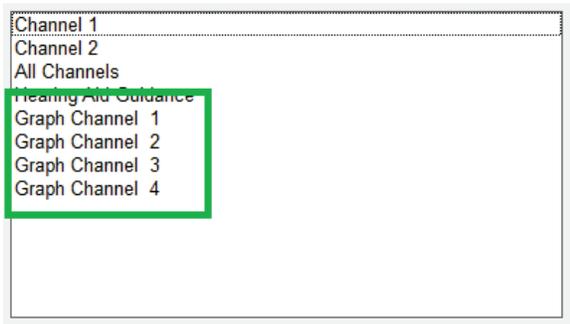
6. Print the report.

Graph Channel Report

Graph channel reports will print a patient report which displays an image of the patient’s tinnitus with QR codes for YouTube videos that play a wind modulation noise nearest to their tinnitus. To generate the report you must:



1. To generate your tinnitus assessment report, select “printer ...” from the File menu.



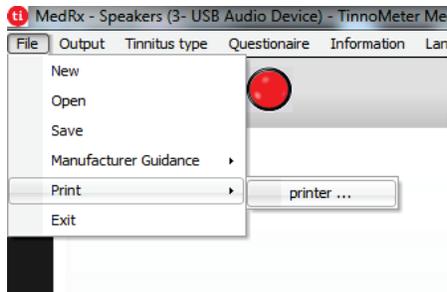
2. Select “Graph Channel” from the list of reports. Select the channel number which you used to match your patient’s tinnitus sound.



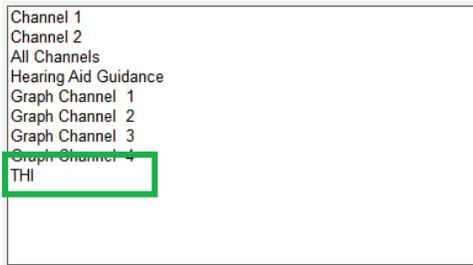
3. Print the report.

Questionnaire Report

Questionnaire reports will only show as an option once the questionnaire has been completed. Once a questionnaire has been completed and you are ready to print a report you must:



1. To generate your tinnitus assessment report, select “printer ...” from the File menu.



2. Select the name of the questionnaire you want to print from the list of reports.



3. Print the report.

Hearing Loss Simulator

The **H**earing **L**oss **S**imulator (HLS) demonstrates the effect of the client's hearing loss for the significant third party. The program attenuates an input signal to simulate the audiogram. The third party listens to the free field speakers. The third party can hear how their own voice is distorted by the hearing loss when the Record input option is used.

The Hearing Loss Simulator requires the client's Audiogram data. This data can be manually entered in the Audio screen of this or any other task.

How to perform the Hearing Loss Simulator task

- Select the **HLS tab** on the toolbar.
- Enter the Audiogram values manually if the data is not automatically imported to this screen.
- Select the **input signal type**: *Mic, File or Record*. Select the track and the *Play* button on the control panel. See below for instructions on how to use the Record option.
- The HLS output is directed to the free field loudspeakers.
- Select **Normal** to play the input signal as a person with normal hearing would perceive it. Select **Simulated** to turn on the simulation of the client's hearing loss. Toggle between these selections as necessary.
- The **Reset** option restores the audiogram to the original state. Use this option if you have modified the audiogram but want to undo the changes. The changes to the Audiogram that are made on the HLS screen are temporary and will not affect the client's original audiometry record.
- A volume control adjustment bar allows for manual adjustment of the output level of the free field speakers.
- To stop the playback, select the *Stop* button on the player.

NOTE: It is recommended you use a variety of tracks from the list to demonstrate the hearing loss.

Record Input Option

This option allows recording and playing back of the voice of the third party.

Master Hearing Aid

Master Hearing Aid (MHA) is an alternative to using a stock hearing aid to demonstrate the benefits of amplification to an inexperienced user. The system applies the fitting rules by default to the patient's audiogram and simulates a hearing aid. The patient listens to this signal through the headphones. Options for editing the gain applied to the audiogram are provided.

About the Master Hearing Aid Display

The Master Hearing Aid screen displays a graph with dB Gain on the vertical axis and Frequency in Hz on the horizontal axis. The plot on the graph represents the gain applied to the patient's Audiogram. The NAL-RP is applied by default. A new rule can be selected from the list on the right side of the display. A volume adjustment bar allows for manual adjustment of the output level. The control panel on the right of the display provides options for input signal source and the task icons for Normal and Simulate.

The Master Hearing Aid applies gain separately for each ear. If audiogram values are entered for the left and right ear, the selected fitting rules will be applied to each ear separately. Different rules may be entered for different ears (i.e. NAL-RP for left ear and BERGER for right ear). If an audiogram is entered only for one ear, the gain will not be adjusted for the opposite ear and the sound for that ear will be normal.

If **Binaural** mode is selected, the sound will be heard from both channels (left and right). If **Monaural** mode is selected, the sound will be heard only from the channel corresponding to the active ear when the channel for the opposite ear will be muted.

Input signal

Live voice (microphone) allows you to use the talk-over microphone for live speech input to the inserts. The clinician or significant third party can speak into the microphone for this activity. Note: there is a processing delay between the input and playback. Make sure that the client cannot hear the voice directly but only through the headset. If this is not possible, use the Recorder (describer below) to simulate speech input.

File allows the user to play sound files. The program supports MP3 and WAV files and comes with pre-set *MedRx Sounds Sensations* sound files. After the option is activated, use the player panel to control the playback.

CD allows the user to play music CDs. After the option is activated, use the player panel to control the playback.

Record input mode allows the clinician or third party to record a sample of their speech which can then be replayed for repeat comparisons under different amplification conditions for the patient. Refer to the interactive Help system by pressing F1 or clicking the Help icon to learn more about the recorder.

How to use the Master Hearing Aid:

1. Select the **Master Hearing Aid (MHA)** icon from the main screen.
2. Enter the Audiogram values manually if the data is not automatically imported to this screen.
3. Select the input signal type: **File**, **CD**, **Mic**, or **Record**.
4. Select **Monaural** or **Binaural**.
5. Select the **Normal** icon, which will send the input signal through to the inserts without modification. The patient is listening to the signal without any amplification benefit. Select the **Simulate** icon to modify the input signal according to the selected rule. This selection allows the patient to hear the benefits of amplification. Toggle between these two selections as necessary.
6. If the simulated frequency response needs to be adjusted, based on feedback from the patient, manually edit the response by clicking on the gain curve at the desired frequency and new gain level. The gain curve of the selected test ear on the control panel can be edited. To edit the other ear, click the appropriate test ear icon on the control panel first.

Hint: Use the **track return** icon on the player control panel to replay one track continuously.

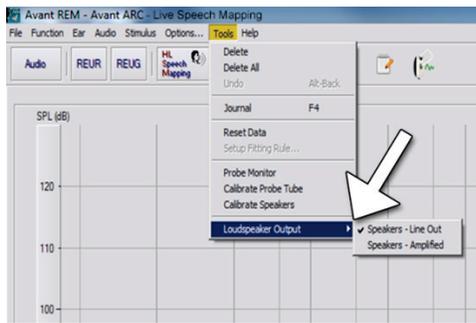


The **Reset** option restores the rule to the original state. Use this option if you have modified the rule but want to undo the changes.

Preparing for Real Ear Measurement Testing

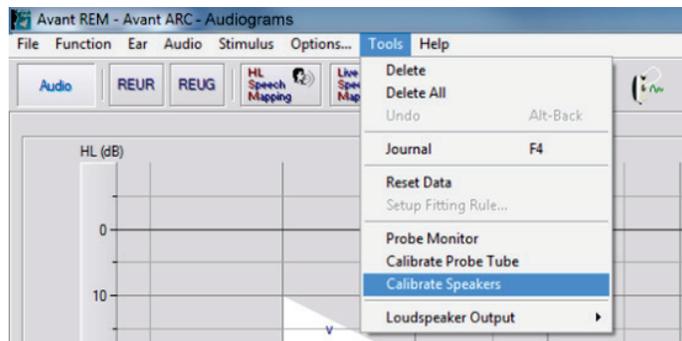
Loudspeaker Output Selection

There are two possible loudspeaker selections. Either the Line Out selection that uses powered speakers as shown on the following pages or the internal amplified speaker output (Red and Blue connectors) can be used with passive speakers. Go to the Tools menu and select the speaker selection you want. A check mark will be shown next to the selection. Refer to the speaker wire installation method under "To Install Free Field Speaker Wires" seen below.



Speaker Calibration

Open the Speaker Calibration screen from REM/LSM screen menu **Tools > Calibrate Speakers**.



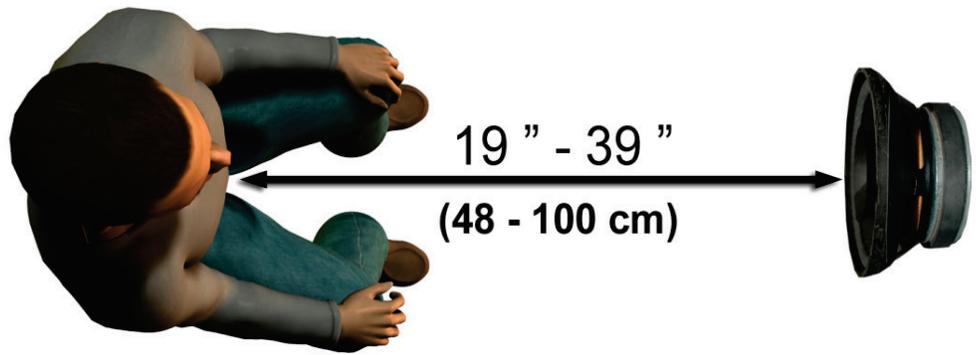
The speaker should be positioned in such a way that nothing blocks the path of the emanated sound in front and on the sides of the speaker. For example, positioning a speaker behind a monitor is incorrect and can severely affect its response at the measurement location. The speaker diaphragm should be at about the same level as the patient's ear and the reference microphone.

Place the reference microphone at the location where the patient normally sits, or about 1 meter from the speakers.

Click on **Start** to begin the calibration and wait until it ends. Observe the response curve flatten itself out. The darker curve is showing the response used by the equalization algorithm, the lighter curve is showing the current microphone input. Use of the powered speaker supplied with this device is recommended.

Positioning the Speakers

Proper positioning of the loudspeakers relative to the patient's hearing instruments is critical for making accurate and repeatable measurements. Seat the patient so their ear is between 19 and 39 inches from the loudspeaker.



Make sure the grill of the loudspeaker is level with and directly in front of the patient's head.

When using Live Speech inputs, position the patient so the mouth of the person speaking is in the same position as the loudspeaker shown here.

▼ Calibrating the Probe Tube

 For reasons of infection control and reliability of results, MedRx recommends that a new probe tube be used with each patient. **To ensure accurate measurements, it is necessary to calibrate the probe tube each time it is replaced.**

1. Place a new probe tube on the probe microphone port as shown.
2. Place the probe tube between the calibration nibs as shown. Be sure that the opening of the probe tube is centered on the opening of the reference microphone.



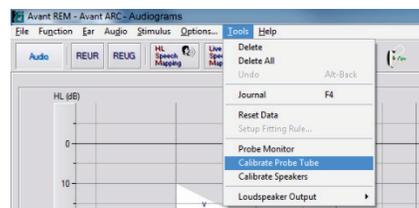
In the Avant REM - Avant ARC software, do one of the following:

- Click the **Probe Tube Calibration** Icon.



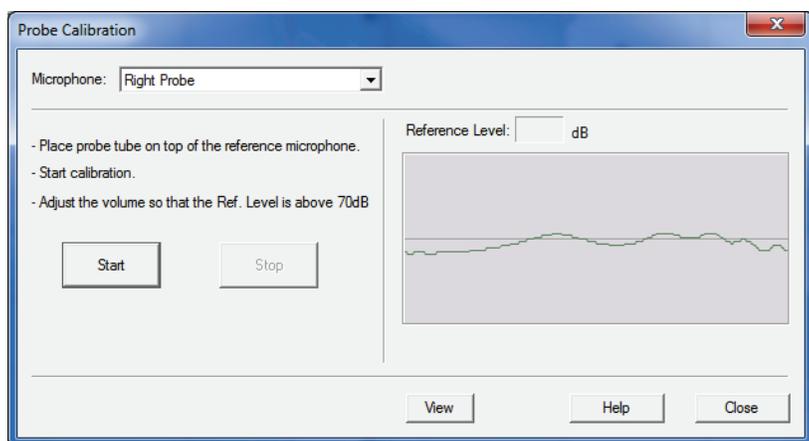
or

- Click **Tools**.
- Click **Calibrate Probe Tube**.



Position probe microphone with probe tube in calibration position between 19 and 39 inches from the loudspeaker and Click **Start**. The signal must be at least 70 dB to complete a valid calibration. If the screen prompt indicates the signal is too low, increase the volume on the loudspeaker or move the probe microphone assembly closer and re-start the calibration. The system will calibrate and stop on its own.

Repeat for the other probe. Valid calibrations have the same approximate shape as the gray target curve. If the measured calibration curve differs greatly in shape or amplitude from the gray target curve, replace the probe tube and re-calibrate. If this does not correct the problem, contact MedRx technical support at (888) 392-1234.



The calibration date is available from the AVANT ARC main screen under the **Function > Calibrate > Calibration** Information tabs.

Return Probe Microphones to MedRx for annual re-calibration. Annual re-calibration ▼ of the Avant ARC Probe Microphones is recommended. There are no user repairable components of this device.

Live Speech Mapping

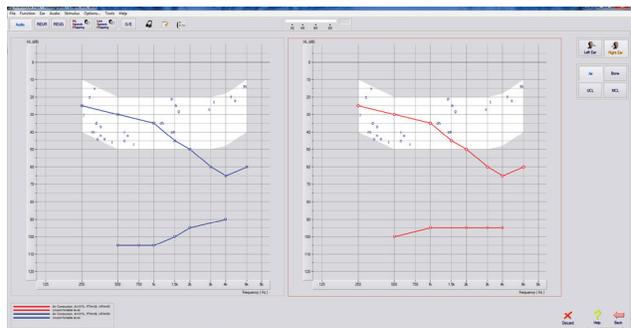
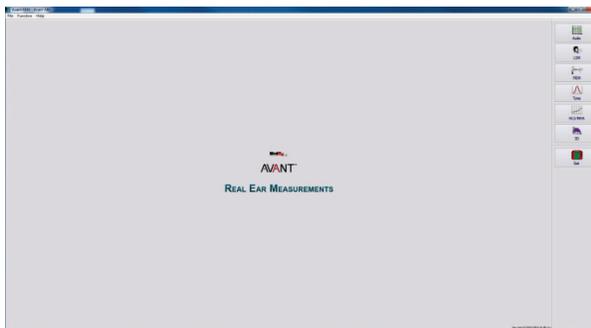
Step-by-Step Guide to Live Speech Mapping

Ensure the Audiogram is Entered

Before making Live Speech Mapping measurements, the patient's pure tone audiogram must be available to the software. This can occur several ways:

1. The audiogram was automatically entered by MedRx AVANT Audiometer software when testing. Then saving the NOAH session.
2. The audiogram was manually entered into the NOAH software and saved.
3. The audiogram was entered using another manufacturer's audiogram module and saved in NOAH.

If none of these have occurred, you may manually enter the audiometric data into the Avant REM - Avant ARC software as follows:



1. Launch the audiometric module by clicking on the **Audio** button on the right side of the AVANT main window.
2. Using your mouse, select the **test ear**.
3. Select the test type **Air**.
4. Enter thresholds by clicking the intersection points with the mouse. (You may also enter the audiogram by selecting the audio tab in either the LSM or HLS/MHA screens).
5. Repeat for UCL (Bone and MCL optional).
6. Repeat steps 3-5 for the other ear.

After the audiogram as entered, click the **Back** button to return to the AVANT Main screen.



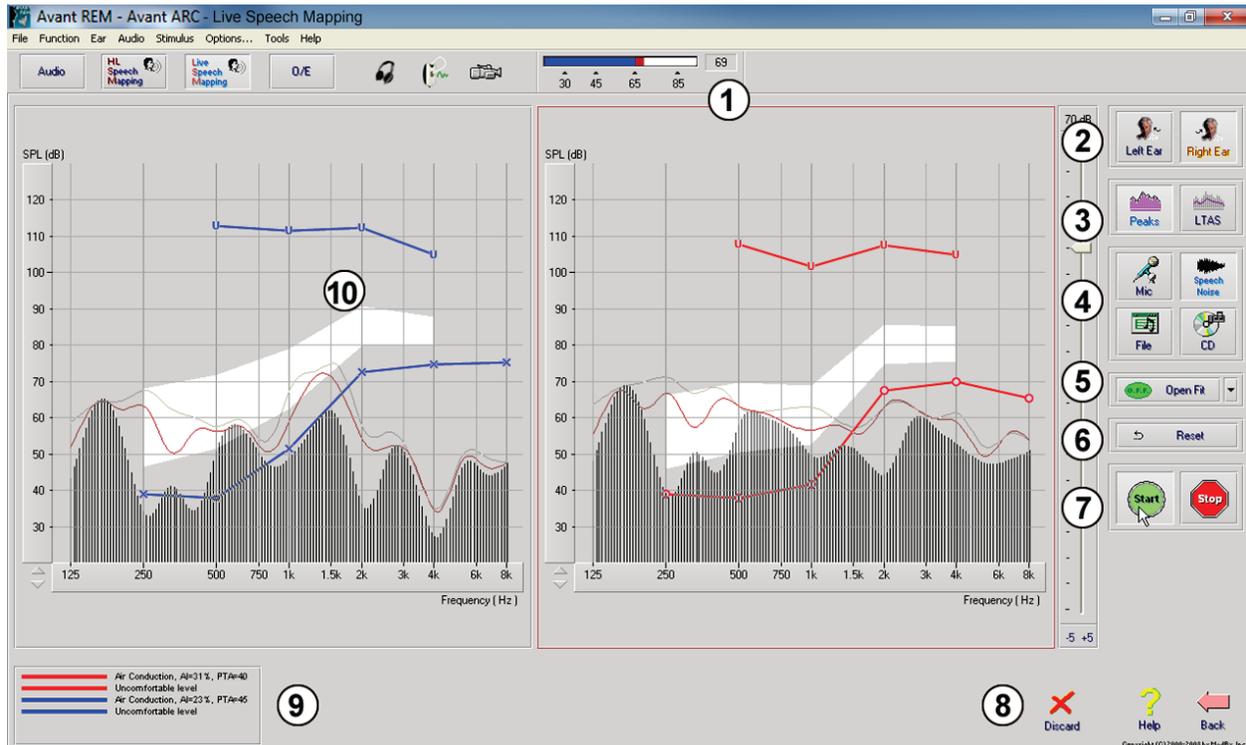
1. From the AVANT Main screen, click **LSM**.



2. In the next Window, click **LSM** again.

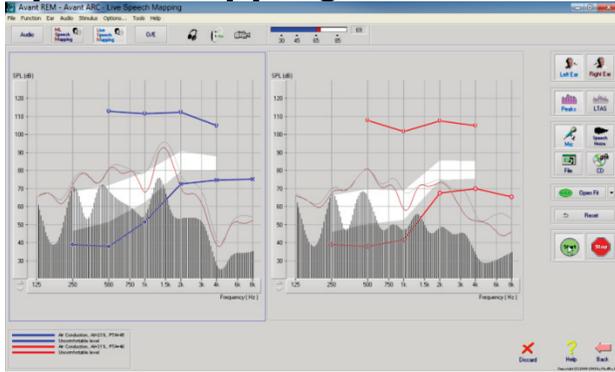
The Operator Headphone is used by the operator to monitor the signal being received by the probe microphone.

The screen shot below provides an overview of all the tools and controls on the Live Speech Mapping screen. For more information on these features, please consult the Interactive Help system by pressing the F1 key or clicking the Help icon.



1. Sound level meter
2. Ear selection
3. Measurement type
 - Peaks
 - LTAS
4. Input Selector
5. Open Fit Function
6. Reset Button
7. Test Interrupter
8. Discard, Help and Back buttons
9. Legend
10. Target area – can be any of the following:
 - MedRx Modified Speech Spectrum
 - DSL IO
 - NAL-NL2

Speech Mapping with Live Voice Inputs



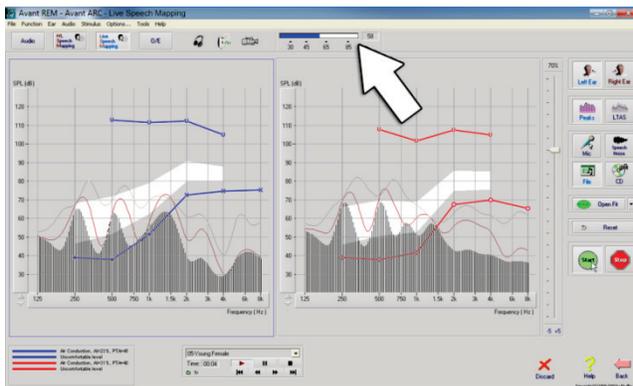
The screenshot on the left shows the Live Speech Mapping (LSM) window. The system is designed to capture and display the human voice in the ear canal, so it is recommended to use the microphone input and the peaks measurement.

Using the microphone allows measurement of both the professional's voice and that of the patient's significant other.

To improve repeatability of measurements, it is recommended that the speaker read a standard passage such as the "Rainbow Passage" which is provided on pg. 31.

NOTE: The screen shot above shows the MedRx Modified Speech Spectrum (Canoe). It is also possible to underlay **DSL IO** or **NAL-NL2** targets on this screen. Click **Options** in the text menu bar on the top of the screen to select and configure these underlays to meet the needs of your practice.

Speech Mapping with Recorded Inputs



For those who prefer a recorded, repeatable stimulus for Speech Mapping, the software provides several digital audio files. These are accessed by clicking the **File** button on the right and then selecting the desired track from the pull-down menu in the audio player. Peak measurements is recommended.

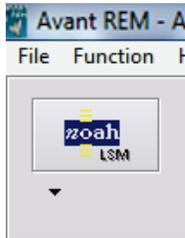
Once the desired track is selected, click the **Start** button to begin measuring. A pure tone or white noise will be presented and once it reaches the selected input level with the slide bar, the chosen track will play. When enough data is collected, click the **Stop** button to stop the recording and capture the measurement.

It is also possible to use an audio CD, such as the patient's favorite music to perform Speech Mapping. Simply click the CD button and then select a track as above. Use the sound level meter on screen to check the proper level. Adjust the output of the speaker to desired level using the sound level meter. (Remember conversational speech is 65 dB SPL at 1 meter).

NOTE: The screen shot above shows the MedRx Modified Speech Spectrum (Canoe). It is also possible to underlay **DSL IO** or **NAL-NL2** targets on this screen. Click **Options + Show Targets** in the text menu bar on the top of the screen to select and configure these underlays to meet the needs of your practice.

Running Speech Mapping “On-Top” within NOAH

It is well established that verifying the output of hearing instruments in the patient’s ear will improve the accuracy of the fitting. In the past, it has been difficult to verify these fittings since many real ear systems have been disconnected from the fitting system. The AVANT ARC system is tightly integrated with NOAH, the industry standard for audiometric and fitting data storage and retrieval. The “on-top” mode of the Avant REM - Avant ARC software allows you to effortlessly alternate between measurement and fitting adjustments.



From the Avant ARC main screen, click the **NOAH LSM** button.

The Avant REM - Avant ARC window will reduce in size and float “on top” of the NOAH screen.

Open the fitting module from the NOAH Module Selection Screen.

Use the text menus and green (start) and red (stop) buttons in the floating LSM window to make Speech Mapping measurements.

Make necessary changes to the instrument based on these measurements.

To make adjustments to the hearing instrument, click on the fitting module window and modify the settings according to the manufacturer’s instructions, being sure to activate, apply or save the settings to the instrument.

Repeat this measure/adjust/measure cycle until the fitting is optimized.

Completing the On-Top Mode Process

Close the REM module by clicking the **X** button and select the **Exit** icon. Save the NOAH session when prompted.

MedRx Live Speech Mapping Protocol

Unlike other products, the AVANT ARC system places full control over the measurement environment firmly in the hands of the hearing care professional. The system is powerful, yet extremely flexible, allowing each provider to use Live Speech Mapping in a way that compliments their practice style rather than compromising it.

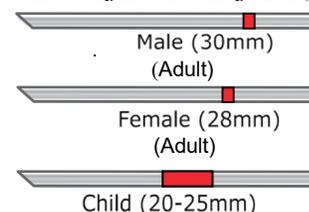
In order to get you “up and running” with the AVANT ARC system, MedRx has developed the following protocol. This simple procedure has been found to be effective with both audiologists and hearing instrument specialists. After mastering the basic operation of the system utilized in this protocol, you are encouraged to further expand your use of Live Speech Mapping in your practice. Feature-specific help is available by simply pressing the **F1** key or clicking on the **Help** icon or text menu.

1. Complete a careful otoscopic examination as instructed by the manufacturer of your otoscope.
 - For MedRx Video Oscopes, refer to the Help system within the software by pressing the **F1** key or clicking the **Help** icon or text menu.
2. Basic Diagnostics.
 - a. Using your audiometer and NOAH, measure and record the following values:
 - b. Pure Tone Air and Bone conduction thresholds.
 - c. Narrow Band Noise or Pure Tone UCL at 500, 1000, 2000 and 4000 Hz.
 - d. Other tests if needed in your practice or jurisdiction.
3. Position patient as described earlier in this manual.
4. Calibrate Probe Tube as described earlier in this manual.
5. Measure and place the probe tube in the ear canal. (Use guide to the right).
6. Complete a Live Speech Mapping measurement **UNAIDED**.
 - a. Microphone input.
 - b. Peak Measures.
 - c. 1/3 Octave resolution.
7. Carefully place the hearing instrument in the ear without disturbing the probe tube.
8. Complete a Live Speech Mapping measurement **AIDED**.
9. Using the On Top Mode, make any adjustments needed to the hearing instrument so that:
 - a. The LSM curve for Quiet Speech (50 dB) is at the bottom of the white modified speech spectrum (canoe).
 - b. The LSM curve for Conversational Speech (65 dB) should be within the white modified speech spectrum.
 - c. The LSM curve for loud sounds (85 dB) (very loud speech, clapping hands, etc.) is approximately 10 dB below the UCL curve.



Probe Tube Insertion Guide for Live Speech Mapping and Conventional REM

(re: Pomford, J & Sinclair, S. Real-Ear Measurement. Basic Terminology and Procedures. Audiology OnLine.com)



1. Perform Otoscopic Examination
2. Align end of Probe Tube with the left end of the appropriate guide
3. Align tube marker with the red marker above
4. Place Probe Tube in ear canal
5. Confirm placement with Otoscope
6. Perform Live Speech Mapping & REM

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Real Ear Measurements

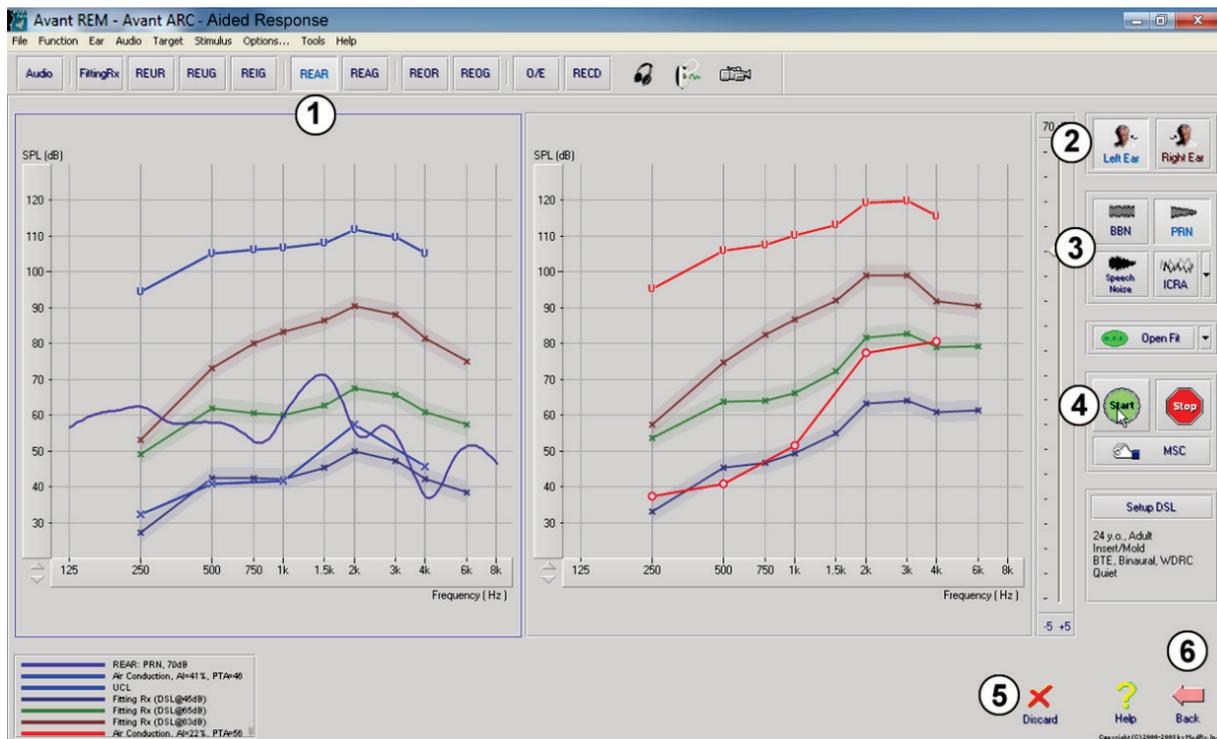
In addition to Live Speech Mapping, the Avant ARC supports all conventional Real Ear Measurements (REM). All of these tests are accessed from the main Avant ARC-REM screen.

To begin, click the



button on the right of the Avant main screen.

In general, REM tasks are performed as follows:



1. Select the REM test you wish to perform from the top row of buttons.
2. Select the test ear.
3. Select the test stimulus.
4. Click **Start**. The test will stop itself after sufficient data has been collected.
5. If you wish to delete a curve, simply select it with your mouse (left click) and then click the **Discard** icon or press the **Delete** key.
6. When all measurements are complete, click the **Back** arrow to return to the AVANT Main Screen.

Descriptions of the various “Stimulus” options are presented in the Help files under the topic “Signal Types”. Access these by clicking on the **Help** tab at the top of the screen, and selecting **Help Topics**. Select an item from the list in the Index tab, and click **Display**.

Stimulus Signal Types

Pure Tone

A pure sine wave. Crest Factor = 1.41 (3.0dB)

Broadband Noise (BBN)

Uniform random noise with normal (Gaussian) amplitude distribution. Can be weighted to White, Pink, Speech ANSI, and Speech Byrne (see below.)

Pseudo Random Noise (PRN)

A "synthetic" broadband random noise. It is less uniform than BBN, has lower spectral density and random volleys. Can be weighted to White, Pink, Speech ANSI, and Speech Byrne (see below.)

ICRA Noise

This stimulus was developed for measuring characteristics of non-linear instruments. The noise is weighted to Byrne LTASS.

ISTS

(International Speech Test Signal)

Initiated by European Hearing Instrument Manufacturing Association (EHIMA.) This signal is based on natural recordings of 21 female speakers in six different languages - American English, Arabic, Chinese, French, German and Spanish. The signal is largely non-intelligible because of segmentation and remixing. The speech material was filtered to Byrne LTASS.

Crest Factor: 9.23 (19.3dB)

Rainbow Passage

Natural recordings of several voices reciting the rainbow passage. Shaped to Byrne LTASS.

Broadband Noise Weighting

White

This is essentially no weighting or filtering. The White Noise has flat power spectral density. Power at every frequency is equal. Because the density of frequencies (individual cycles) raises with frequency, there is more energy in high octaves. White-weighted noise can be used mostly for testing of equipment. It is not recommended to use it for hearing aid fitting, unless specified by the manufacturer.

Crest Factor: BBN = 1.73 (4.8dB), PRN = 7.86 (17.9dB)

Pink

The noise is filtered so its energy per frequency (power spectral density) is inversely proportional to the frequency. Each octave carries the same amount of energy. Comparing to White Noise, the Pink Noise energy drops approximately 3dB per octave. Pink-weighted noise can be used mostly for testing of equipment. It is not recommended to use it for hearing aid fitting, unless specified by the manufacturer.

Crest Factor: BBN = 3.67 (11.3dB), PRN = 6.55 (16.3dB)

Speech - Byrne

The noise is approximately weighted to International Long Terms Average Speech Spectrum (ILTASS) as described in Byrne et. al., 1994.

The noise with this weighting is preferred for hearing aid fitting because its spectrum is the best approximation of the spectrum of real human speech.

Crest Factor: BBN = 4.22 (12.5dB), PRN = 3.47 (10.8dB)

Speech - ANSI

The noise is approximately weighted to ANSI S3.42 Speech Noise.

The noise with this weighting can be used for fitting hearing aids. The slope of ANSI-weighted noise is not as steep as Byrne-weighted, so there is more power in higher octaves. This will result in less gain required by the hearing aid to reach targets, but may result in under-fitting at high frequencies.

Crest Factor: BBN = 4.46 (13.0dB), PRN = 5.17 (14.3dB)

To activate specific REM tests, click the buttons as follows:

Audio	Opens the audiometry data entry screen. Use this if audiometry has not been previously measured and entered into NOAH.
FittingRx	Allows the selection of fitting rules to generate targets. The following rules are supported: ½ Gain, POGO I, POGO II, Berger, 1/3 Gain, NAL-RP, FIG6, DSL, NAL-NL1.
REUR	Real Ear Unaided Response - Measures the additive effect of the ear canal's resonance to a stimulus. Reported as dB SPL of output.
REUG	Real Ear Unaided Gain - Measures the additive effect of the ear canal's resonance to a stimulus. Reported as dB SPL of gain. If a real ear unaided response (REUR) curve has been measured, the corresponding real ear unaided gain curve is automatically plotted to the REUG screen.
REIG	The difference between the REUG and the REAG is called the Real Ear Insertion Gain (REIG). This Insertion Gain information is used to compare to the target gain curve selected for the client.
REAR	The Real Ear Aided Response (REAR) is the sound pressure level in the ear canal measured with the probe microphone close to the eardrum and the operating hearing instrument inserted in the ear and turned on. ANSI defines REAR as the SPL, as a function of frequency, at a specified measurement point in the ear canal for a specified sound field, with the hearing aid in place and turned on.
REAG	The REAG is simply the REAR expressed as gain rather than SPL. Selecting REAG allows you to see the gain at each frequency for each of the REAR curves measured.
REOR	REOR measures the effect on the natural external ear effects resulting from inserting an ear mold or a hearing instrument, before it is turned on, into the ear canal. The REOR is also referred to as Insertion Loss. REOR is also useful for validating the effectiveness of venting or canal length changes to the mold.
REOG	The Real Ear Occluded Gain (REOG) is the difference in decibels, as a function of frequency, between SPL in the ear canal and SPL at the reference microphone at the entrance of the ear canal with the hearing aid in the ear and turned off. For each REOR measurement curve, the corresponding REOG curve is calculated and automatically plotted to the REOG screen. The REOG function is useful in determining the acoustic seal of a hearing aid, relative to a sound field outside the ear.
O/E	Some clients report they seem like they are "speaking in a barrel" or "feel blocked up". These are signs of a build up of self generated low frequency energy in the ear canal. This excessive occlusion can be measured objectively in the Occlusion Effect task.
RECD	The Real Ear to Coupler Difference (RECD) is used to simulate real ear measurements by coupler measurements and is useful when fitting children or "difficult" to fit patients. See the section on RECD later in this manual for more detail.

Additional Tests & Features

Real Ear to Coupler Difference (RECD)

The Real Ear to Coupler Difference (RECD) is used to simulate real ear measurements by coupler measurements and is useful when fitting children or difficult to fit patients. RECD measurements can be conducted outside of a Hearing Instrument Test Box when using the optional MedRx RECD Coupler.



The RECD values are used as a correction to coupler measures for that client's hearing instruments. By performing all subsequent measures in the coupler and applying the RECD corrections to the coupler measures, the "real ear" factors are incorporated into the results. The resulting simulated measurements provide information to select and make adjustments to the hearing instrument and verify adjustments in the MedRx coupler rather than in the uncooperative client's ear. This is particularly important in the case of children, whose small volume ear canals enhance high frequency amplification more so than in average adults. This is an essential consideration in determining the maximum output of the hearing instrument.

If RECD data is present, the software will display an option to choose between Ear or Coupler measurement on all Real Ear screens where measurements in a coupler are appropriate.

There are two ways to measure the REAR response with optional RECD coupler: using an insert headphone or a hearing instrument.

If a hearing instrument is used, its volume control setting and other parameters should *remain the same* for both REAR and coupler measurements. Set the volume control to moderate, and turn the compression and noise reduction circuits off.

Using open-fit hearing aids for RECD measurements may result in invalid low and mid-frequency measurements because of insufficient gain at those frequencies. Please contact your hearing aid manufacturer for recommendations.

How to perform the RECD task

First, perform the REAR task to obtain an REAR curve. This can be measured with a hearing instrument or an insert earphone.

REAR with a hearing instrument



- Adjust volume of the hearing instrument to comfortable listening level. Turn the compression and noise reduction circuits off.
- Position the client less than one meter from the speaker and facing the speaker.
- Place the hearing instrument and the probe microphone tube as for all REM measurements.
- Select **START** to open the measurement type selection screen.
- Choose the **REAR** with a Hearing Aid option.
- Select **OK** to begin the test and wait until it concludes.

REAR with an insert headphone



- Place the probe microphone tube as for all REM measurements but use the insert headphone instead of a hearing instrument.
- Select **START** to open the measurement type selection screen.
- Choose the **REAR** with an Insert Headphone option.
- Select **OK** to begin the test and wait until it concludes.

Coupler Response

When the REAR is complete, you are prompted to perform a coupler response.



- Attach the hearing instrument or the insert headphone (*must* be the same as used in the REAR test) to the appropriate coupler and place the probe tube inside the coupler.
- If a hearing instrument is used, be sure to perform this measurement at the same volume control setting as the first measurement.
- Select **START** to open the measurement type selection screen.



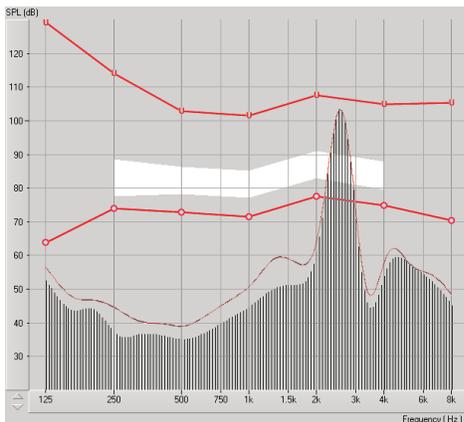
- Choose the **Coupler Response** option or Use **Stored** to skip the measurement (see note below.)
- Select **OK** and wait until the test completes.
- The calculated RECD curve is automatically displayed on the screen and is stored in memory for correction of subsequent coupler measurements made from the RECD function.

 Note: If the REAR and the coupler response were measured with the insert headphone, the program saves the coupler response curve for later use. In this case to obtain another RECD, only REAR with insert headphone measurement is necessary. This is possible because the coupler response does not change provided that *neither the coupler nor the insert earphone has changed*.

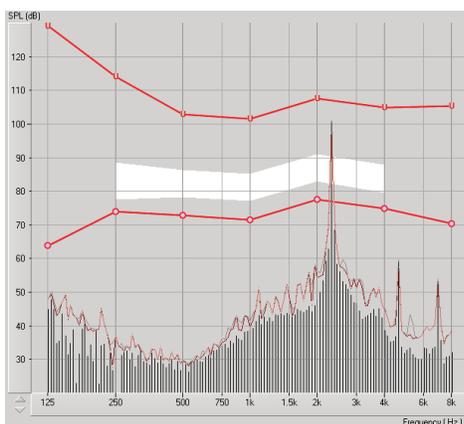
 Note: After measuring RECD, it is possible to perform Live Speech Mapping in the coupler as well. Look for the "Measuring in" option on the LSM screen.

Measuring Acoustic Feedback

Feedback (whistling, howling) is one of the most common complaints of hearing instrument users. Even though many modern hearing instruments have sophisticated feedback management systems, knowing exactly where the feedback is occurring can greatly reduce the time required to resolve the problem. The AVANT ARC system does an excellent job measuring and displaying acoustic feedback.



1. Place the calibrated probe tube in the ear canal as instructed previously.
2. Place the hearing instrument in the ear without disturbing the probe tube.
3. Begin a Live Speech Mapping session as instructed previously.
4. When feedback is present, click the **Start button**.
5. Acoustic feedback appears as a large spike in the LSM response.

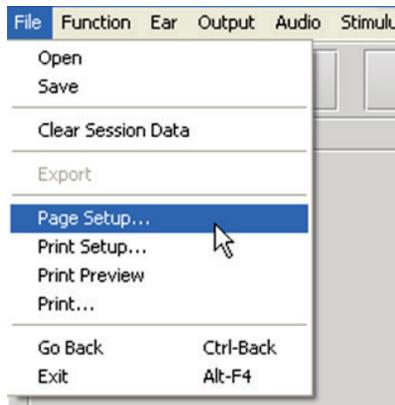


If a more specific frequency analysis of the feedback is desired, change the resolution of the system to 1/24 octave by clicking the **Options** menu item and changing the Analyzer selection using the pull-down menu. This image shows the same feedback as above at **1/24 octave**.

Using this information, make any necessary adjustments to the hearing instrument to reduce or remove the feedback.

Printing

Printing within the Avant ARC software is very simple.



From the File menu, click one of the following options:

Page Setup – Allows you to set margin sizes and the default text header for your reports.

Print Setup – selects the printer you want the report to be sent to.

Print Preview – Shows you what your report will look like before you print it.

Print – Sends the report to the printer. This option opens the Windows Print dialog which allows the user to select any installed printer and modify the properties (quality, number of copies, etc.) for the print job.

Device Maintenance

Annual re-calibration of the transducers used with the Avant ARC is recommended. There are no user repairable components of this device.

Refer to the Installation Manual for care and cleaning instructions.

Customer supplied components of this Medical Electrical system should be cleaned and maintained according to their manufacturer's instructions. (laptops, amplifiers, etc.)

Symbols that may be used:

Read the instruction manuals for safe usage of the device (operating instructions)	Indicates that the device serial number will follow	Type B applied part. (Type B equipment)	Manufacturer (MedRx)	Authorized Representative in Europe
Non-ionizing electromagnetic radiation	Special Disposal Required	Humidity Limitation	Caution, General warning sign	Temperature limitation
Read the instruction manuals for safe usage of the device (operating instructions)	Class II equipment	Start (of action)	Stop (of action)	Percentile Setup
Calibration	Loudspeaker (Speaker)	Headphones	Microphone	Recording
CAUTION For Single Patient Use Only				



The date of manufacture is shown on the original calibration certificate. The year of manufacture is shown in the fourth character in the serial number. M=2014, N=2015, P=2016, Q=2017 etc.

Limited Warranty

MedRx, Inc warrants this product to be free from defects in material and workmanship for one year from the time of purchase. If this system fails to perform as specified during this period, the purchaser is responsible for calling MedRx at (888) 392-1234 or (727) 584-9600. The company's representative will advise the owner to either return specific components or the entire system to:

MedRx, Inc.
1200 Starkey Road #105
Largo, FL 33771 USA

MedRx will repair or replace any defective devices, fully test the system and/or components and ship the system promptly back to the owner. There is no cost for the repair or return shipping, provided the system is one year old or less and has not been misused, abused or damaged. Such damage includes, but is not limited to, dropping, exposure to excessive heat greater than 100°F and water/liquid damage.

Repair or replacement of the system as provided under this warranty is the sole and exclusive remedy of the purchaser. MedRx shall not be liable for any consequential or incidental damages or for breach of any express or implied warranty. Except to the extent of applicable law, any implied warranty, merchantability or fitness of this product is limited to the duration of this warranty.

MedRx will, at its discretion, service and repair out of warranty products at the purchaser's request, charging for parts and labor as necessary.

The limited warranty is deemed void if software or hardware is installed on this product which is not pre-approved by MedRx, Inc. Approved software includes NOAH™ and HIMSA approved hearing aid manufacturer programming modules for fitting hearing aids.

MedRx, Inc is not responsible for problems resulting from installation of unapproved software or hardware. In the event of unapproved software or hardware installed on the system causing a conflict, MedRx will service the product for a fee to be determined at the time of service.

Any extension of this warranty past the initial one-year warranty is subject to the following (where applicable).

1. A \$300 deductible per repair.
2. Extended warranty does not include cables, connectors or peripherals.
3. Extended warranty of the Video Otoscope covers optics only.