



SOFTWARE INSTRUCTION MANUAL

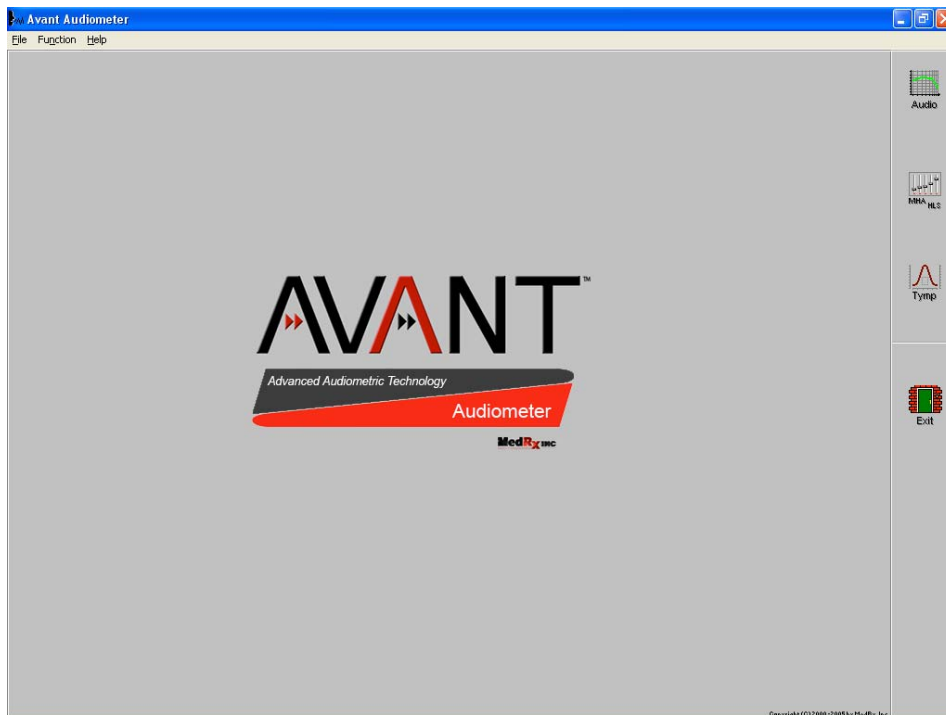


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MedRx INC™

www.medrx-usa.com

1200 Starkey Rd., #105, Largo FL 33771

Toll Free: (888) 392-1234 • (727) 584-9600

Fax: (727) 584-9602 • Email: medrx@medrx-usa.com

MedRx's Authorized Representative in Europe

(Regulatory affairs only)

Emergo Europe, Molenstraat 15

2513 BH The Hague, The Netherlands

Tel: (31) (0) 70 345-8570 • Fax: (31) (0) 70 346-7299

GETTING STARTED

Congratulations!

The integration of the AVANT Audiometer™ in your clinic places the most cutting edge audiometric technology at your fingertips. The time you spend in learning to operate the AVANT Audiometer™ is well invested.

Installation Software

Install NOAH first

Please ensure your copy of the NOAH system 3 software is installed on your computer before installing the AVANT Audiometer™ program.

Insert the MedRx AVANT Audiometer™ disc. Most computers are setup to automatically read a CD when it is inserted into the computer. Setup should therefore load automatically.

Note: If setup and install menu does not appear automatically, go to My Computer and click on the D: drive. Click Setup.exe

Follow the directions in the install menu to complete the installation.



From the desktop, open *NOAH*.

Go to *Tools / Setup / Install Module*.

Click *Install New Module*.

Insert the MedRx AVANT Audiometer™ software CD into your computer.

Click the *Browse* icon.

[Or: go to My Computer, click on the D: drive (or your CDrom drive) and AVANT Audiometer (D:) should appear.]

Click *NOAH* and then click *Install.ini*

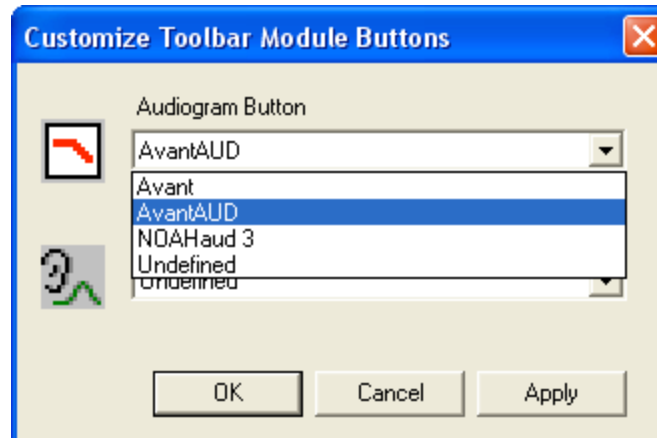
Click *OK*.

Configure the Noah Toolbar

To assign the measurement icon on the NOAH toolbar to the MedRx AVANT Audiometer™, perform the following:

Go to *Tools / Module Buttons*.

Click the down arrow icon under the Real Ear Measurement Button heading and select MedRx AVANT Audiometer™. (you may need to use the scroll bar for the AVANT Audiometer option to appear in the choice box)



Click *Apply*.



Click *OK*.

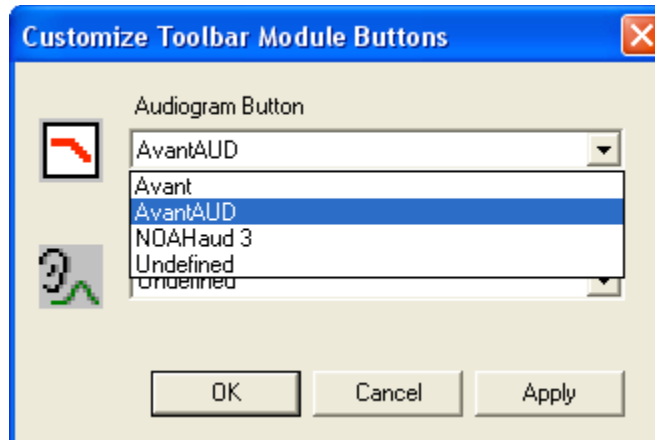
This assigns the real ear measurement icon on the NOAH toolbar to the AVANT AUDIOMETER™.

Alternatively, you can assign the Audiogram icon to the AVANT Audiometer™

MedRx is one of a few manufacturers able to assign an Audiometer to the NOAH Audiogram icon. If you have the MedRx fitting system assigned to the real ear measurement icon, you need to assign the Audiogram icon to the AVANT Audiometer™.

Go to *Tools / Module Buttons*.

Click the down arrow icon under the Real Ear Measurement Button heading and select MedRx AVANT Audiometer™. (you may need to use the scroll bar for the AVANT Audiometer option to appear in the choice box)



Click *Apply*.



Click *OK*.

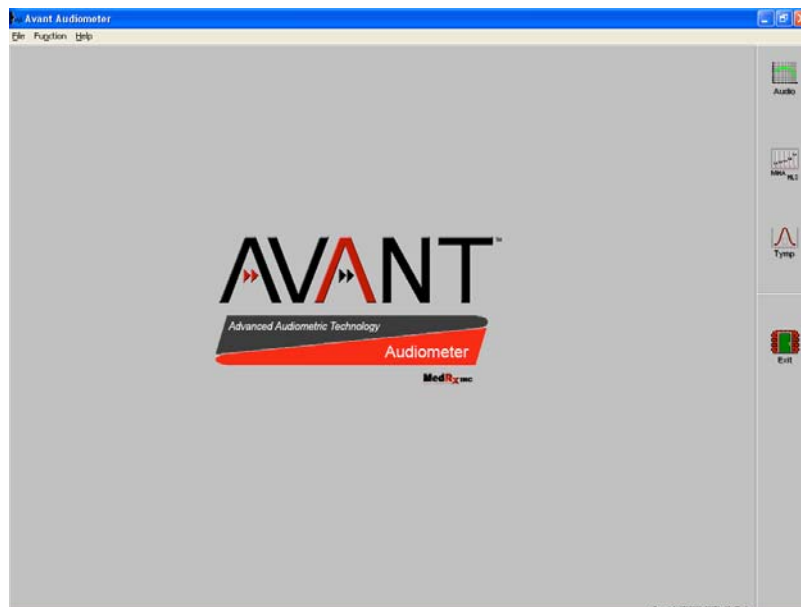
This assigns the Audiogram icon on the NOAH toolbar to the AVANT Audiometer™.

Operating the Avant Audiometer within Noah

Once a client folder is opened, the AVANT Audiometer™ is opened with the Audiogram or Real ear measurement icon on the NOAH toolbar, according to how you customized the NOAH toolbar.

About the AVANT Audiometer™ Software

THE MAIN MENU SCREEN

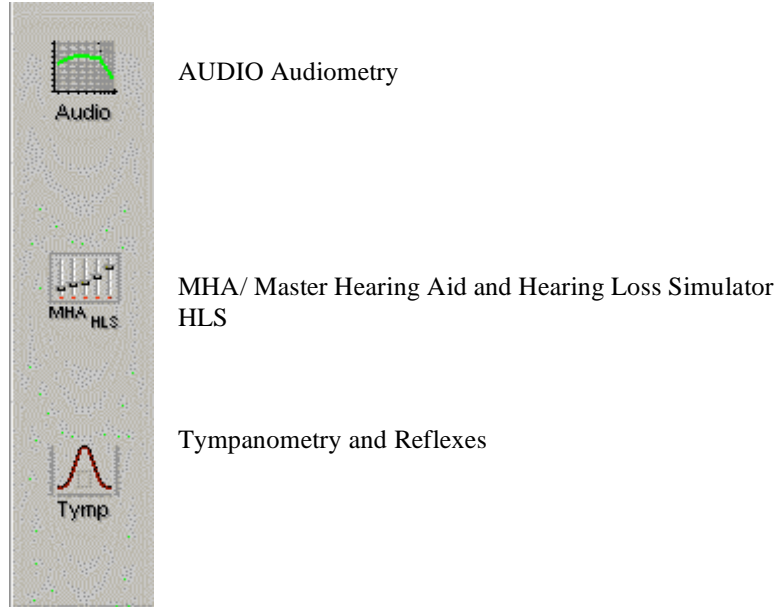


Software Version Number

Read the version number on the **Help | About MedRx AVANT Audiometer™** window.

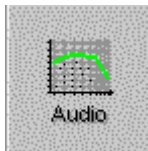
AVANT AUDIOMETER™ Functions

The main menu screen gives you access to the following functions:



SCREEN DESCRIPTION

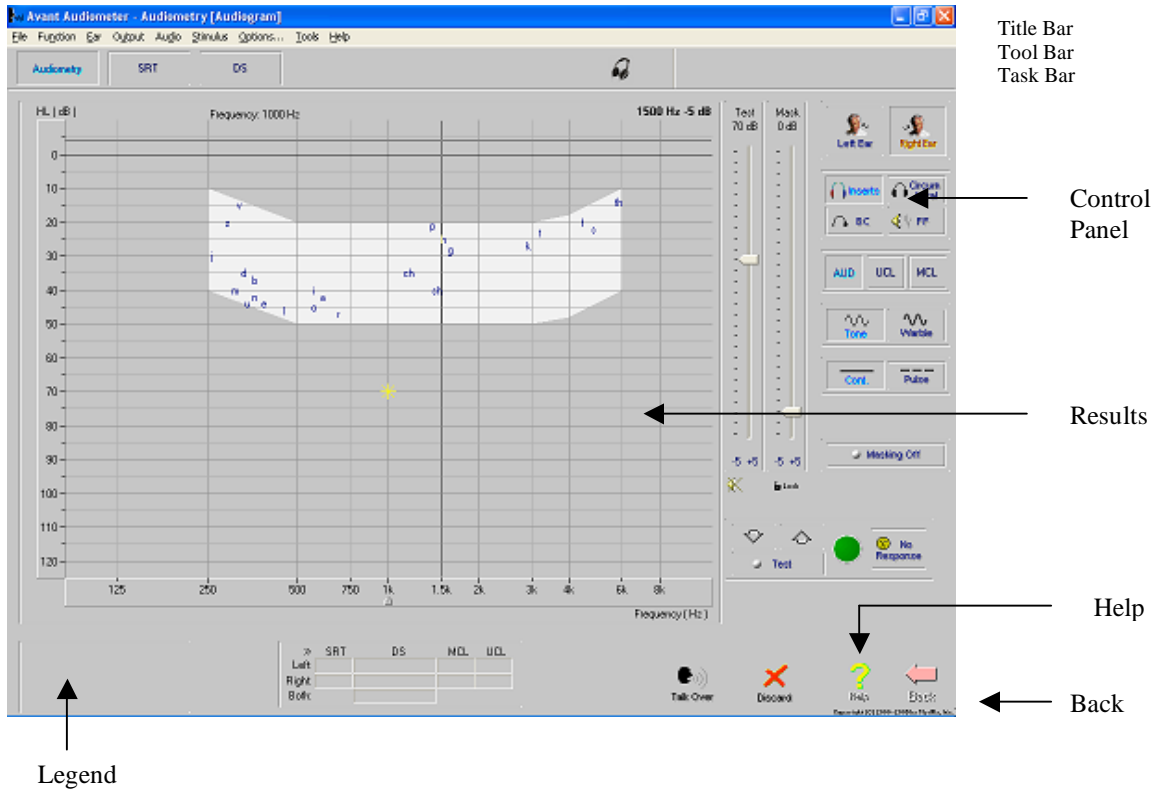
The layout of every screen is consistent throughout the program. Try to locate features as they are described below.



First, click the *Audio* icon on the main menu.

Locate the following features on your screen:

- The Title Bar at the top of the screen states the function you are performing.
- Results are displayed on the standard audiogram or data form at the center of the display.
- The Control Panel for selecting the test ear, signal inputs and transducers is always located on the right side of the display.
- A Legend is positioned in the lower left corner of the display and provides a color-coded key to interpret the results on the display.
- Access Help from the *Help* icon in the lower right corner.
- To Return to the previous screen, use the *Back* icon in the lower right corner.



Saving Data

Results are automatically stored to the NOAH database when you close a client's folder in NOAH. A future lesson describes how to operate the AVANT Audiometer™ in NOAH.

Exiting the AVANT Audiometer™

ALWAYS use the *Exit* icon on the main menu screen to close the AVANT Audiometer™ software. It is recommended you backup the NOAH database frequently to avoid losing data in case of system failure.

CALIBRATION

Guidelines for calibration are provided by your supporting technician for the AVANT Audiometer™. Insert earphones, head phones and bone conductors are required to be calibrated annually by your certified calibration technician. A menu is available for loading calibration files from the disc provided by the technician.

Help

You will find extensive help for all software functions in the Help files. To access Help, click the question mark *Help* icon on the screen or click Help on the toolbar or press F1 on the keyboard.

AUDIOMETRY

This is an easy Audiometer to operate. Take the time to become familiar with the screen and controls by performing the exercises in this chapter.

Opening the Software

There are two ways of operating the AVANT Audiometer™ software.

The preferred operation is to run the AVANT Audiometer™ from within NOAH after you have installed the AVANT Audiometer™ module in NOAH. (Please refer to NOAH module installation chapter in this manual for guidelines)

The AVANT Audiometer™ also runs as a stand-alone program from the desktop. When you use the AVANT Audiometer™ from the desktop, data is not stored to the NOAH database.

Operating the AVANT Audiometer™ from within NOAH:

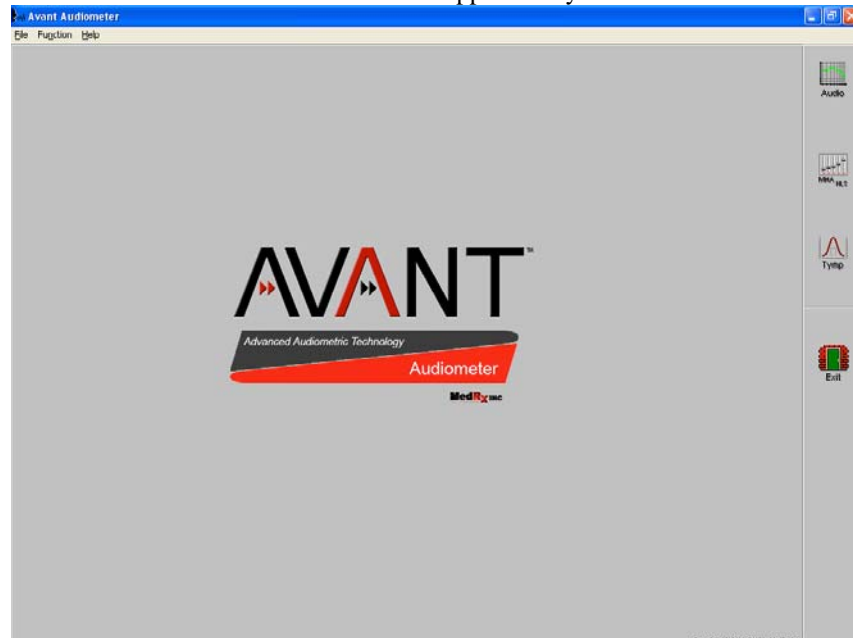
Open *NOAH* from the desktop.

Open the patient's folder (Client).

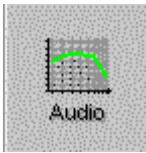
Click the *measurement module* icon on the toolbar. (Or the Audiometer icon if you have configured this to the AVANT Audiometer™ in your NOAH setup)



The AVANT Audiometer™ main menu appears on your screen.



Audiometer Setup



Click *Audio* from the main menu screen to enter Audiometry.

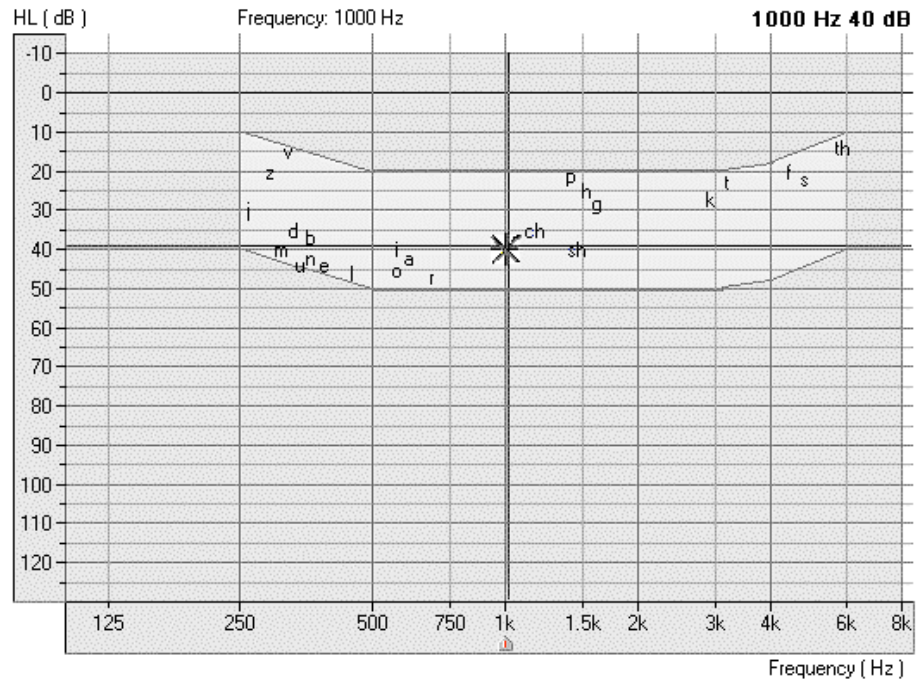


Click *Help*. Read the Tone Audiometry help topic and follow the link to Audiometry Control Panel icons.

Close the Help screen by clicking the X icon at the top right corner of the screen.

What's On The Screen?

Understanding the Audiometry display:



The yellow asterisk symbol on the audiogram lets you know the test level and frequency the Audiometer is currently set to. This information corresponds with the Test dB attenuator level on the control panel and the arrow icon below the audiogram indicates the test frequency.

The Speaker icon, located under the Attenuator control bars, lets you know when a tone is on or off.

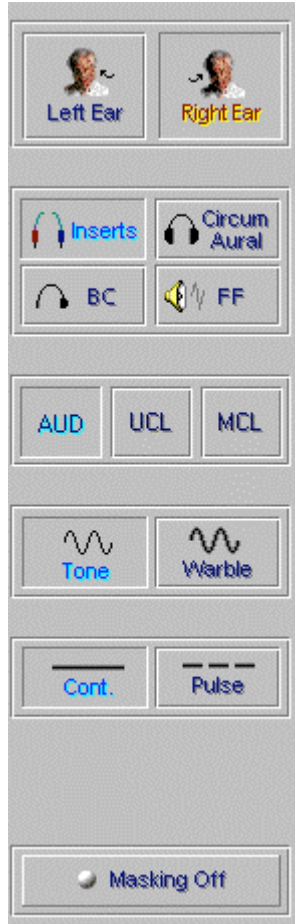


Tone On

Tone Off



Where Are My Controls?



The Audiometry control panel is designed for one icon to be selected in each row.

The default settings are: Right Ear

Inserts Air Conduction

Threshold Audiometry

Tone

Continuous

Masking Off

If you prefer to start testing with a different setup, simply click on the desired icon on the control panel.

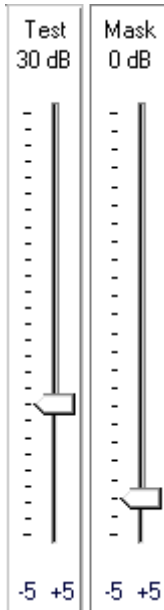
For example: To change from Air Conduction (AC) to Bone Conduction (BC), click the *BC* icon.

To change from threshold testing to either discrete frequency MCL or UCL testing, click on the *MCL* or *UCL* icon respectively.

Masking Controls

The *Masking OFF/ON* icon toggles between OFF and ON with each click on the Masking icon. The icon text indicates the current status. If the icon says Masking On, then masking noise is ON. To turn it off, click on the Masking icon and it will change to Masking OFF.

How Do I Operate the Audiometer?



Setting the Attenuator

There are a few methods to control the test level attenuator in Audiometry. Some methods use the mouse only, while others use the keyboard.

Practice each option below and find the one you prefer.

Option One (most preferred method)

Press the up or down arrow key on the Keyboard to step the attenuator up or down. The default step size is up 5dB and down 10dB. The screen attenuator and asterisk symbol on the audiogram are automatically updated each time the arrow keys are pressed. Monitor the attenuator and response icon while seeking threshold.

Option Two

Click the -5 or +5 icon to change the attenuator in 5dB steps in the corresponding direction.

Option Three

Point the mouse to the *arrow* icon on the Test dB attenuator bar. Click and hold down the left mouse button on the arrow icon and drag it to the desired test level and release the mouse button.

Option Four



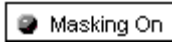
Click on the *Up arrow* or *Down arrow* icons below the Test dB attenuator. Each click steps the attenuator in the appropriate corresponding arrow direction. The default step sizes are up 5dB and down 10dB.

Note: The default step size for the arrow icons and keyboard arrow keys can be customized under **Options | Audiometry**.

Presenting a Tone

*******When you Press and Hold the mouse button or keyboard key on any of these attenuator controls, a tone is presented to the transducer selected.*******

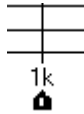
Lock Masking Level to the Test Level



When masking, it is sometimes useful to determine a minimum masking level for a test level and then “lock” the masking attenuator to change with the test level. To do this, first set the attenuator to the test level and then determine the minimum effective masking level needed in the non-test ear. Set the mask attenuator to this level. Now click the *Lock* icon and *Masking On*. All you have to do now is adjust the test level attenuator to find the masked threshold. The masking level will automatically adjust to the new test level as you seek threshold.

Setting the Test Frequency

Option One (most preferred method)



Press the Left or Right arrow key on the keyboard to step the desired test frequency. The arrow icon under the Audiogram indicates the current test frequency. The yellow asterisk on the Audiogram will also track to the new frequency selected.

Option Two

Point the mouse to the desired test frequency script under the Audiogram and click on that frequency. The *arrow* icon will snap to this new frequency.

Practice this option: Point and click the mouse to the text *2k* under the audiogram. The arrow icon will snap to 2k.



Patient Response Indicator

If the patient is using the handswitch, the green patient response icon will highlight on the display when the button on the handswitch is pressed.

No Response



To indicate a patient did not respond to the maximum output of the Audiometer for that frequency, click *No Response*. The appropriate No Response symbol is recorded on the audiogram.

Operator Monitoring Controls

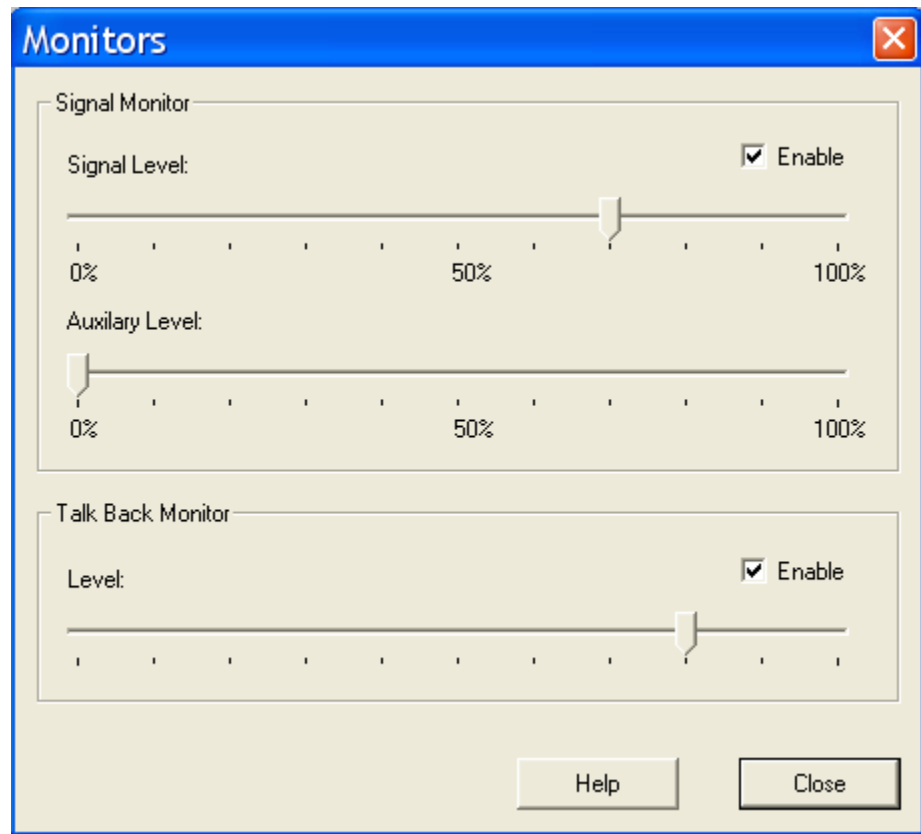
It is important to setup your monitoring controls before testing patients. The monitoring controls available include:

- Signal monitoring
- Masking monitoring
- Patient response for speech testing
- Talk Over

Please ensure the operator monitoring headset, talk forward and talk back microphones are connected to the AVANT Audiometer™ before accessing these controls.



Click the *Headphone* icon on the taskbar to access the monitoring controls.



• **Signal Monitor**

The signal monitor allows you to hear the test tone or speech test word through the monitor headset. Set the signal level to your comfort level by dragging the arrow icon on the control bar. Reset this level if multiple testers are using the system or if new monitor headsets are in use.

- **Auxiliary Level**

The auxiliary level monitors the masking noise. Set the desired level to monitor masking in pure tone and speech testing.

- **Talk Back Monitor**

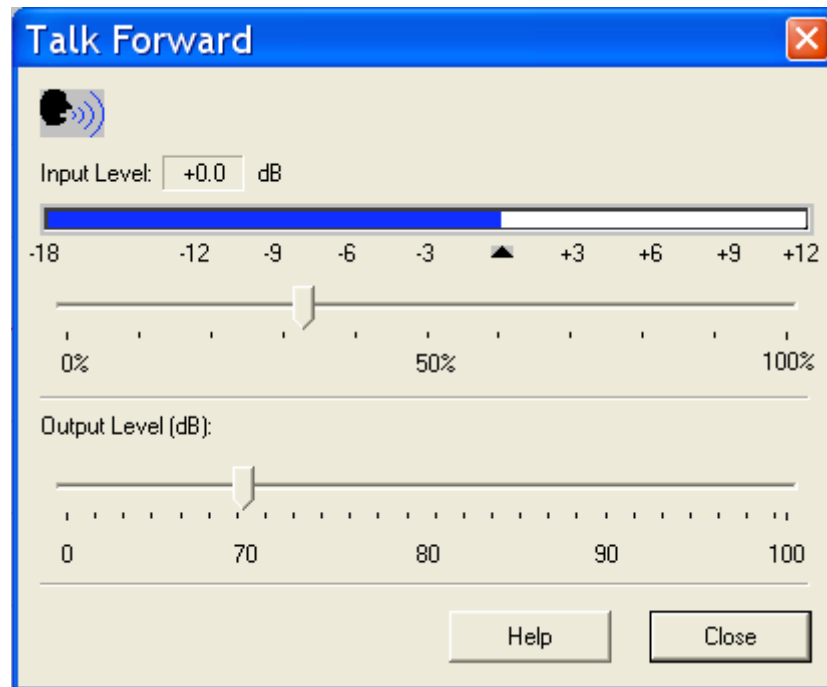
Adjust the talk back monitor according to your patient's vocal effort in responding for speech testing.

Talk Over



Click *Talk Over*.

Position your talk over microphone. The microphone needs to be close to your mouth and maintained at a constant distance from your mouth while in use.



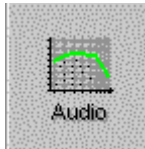
Speak at a normal level and calibrate the Input Level by sliding the *arrow* icon until the blue line on the VU meter just meets the calibration marker. When you see the VU meter line go past this marker, the line will be red. In this case, you have adjusted it too high.

The output to the patient can now be set to the desired decibel level using the Output Volume control. Click and hold the mouse button on the *arrow* icon and drag it to the volume needed for the patient to hear you through the insert earphones. Click *Close* to turn the talkover microphone off.

Fast Track Lesson

A complete hearing threshold Audiogram can be obtained using just the four arrow keys on your keyboard. It's just that easy.

This lesson presents the most common method used to operate the Audiometer to get you up and running quickly. It is assumed you know how to perform a hearing test and simply describes how to operate the Audiometer.



- Click *Audio* from the main menu screen to enter Audiometry.

The default control panel shows

Inserts, Threshold Audiometry, Tone and Continuous.

- Press the up or down arrow key on the keyboard to step the attenuator up or down. The default step size is up 5dB and down 10dB. The screen attenuator and asterisk symbol on the audiogram are automatically updated each time the arrow keys are pressed.

It is best to monitor the attenuator Test dB bar while testing and not the audiogram.

- **Press and hold down** the arrow key to present the tone.

If the patient is using the hand switch, the green patient response icon will highlight on the display when the patient responds.

- Press the Left or Right arrow key on the keyboard to step to the next test frequency. Adjust the attenuator using the up or down arrow key to set the new test level.

(The arrow icon under the Audiogram indicates the current test frequency. The yellow asterisk on the Audiogram will also track to the new frequency selected.)

- To present a tone, press and hold down the arrow key. You may also use the spacebar to present a tone without stepping the attenuator.
- Continue finding threshold for all test frequencies required for an audiogram.

And there you have it!

Follow the same steps for bone conduction and UCL testing, using appropriate testing techniques and masking.

Step-by-Step Audiometry Lesson

Assumption: It is assumed you know how the procedure for finding thresholds for tone audiometric testing.

Practice this exercise on someone from your office. Make sure the test environment is quiet and you have all the audiometric hardware connected to the AVANT ST. Refer to the installation manual if necessary.

Performing the following lessons gives you practice in operating the full range of audiometric functions available in the software

Pure Tone Thresholds

1. Setup the control panel for pure tone audiometry: *Right Ear, Inserts, AUD, Tone* and, *Continuous*.
2. Set the test level attenuator to 40dB.
3. Set the test frequency to 1000Hz.
4. Perform an Otoscopic examination of the ear canals. It is recommended you use your video otoscope to examine the external ear canal.
5. Instruct the patient in the task and how to respond to the tones.
6. Place the insert earphones in the patient's ear canals, ensuring an adequate insertion depth.
7. Present the first tone using your preferred method of presentation.
8. Monitor the patient's response and adjust the attenuator accordingly. You will notice the right AC symbol (O) is automatically recorded to the audiogram.
9. Search for hearing threshold.

When threshold is found, move to 2000Hz and find threshold. Each time you move to a new test frequency, the threshold for the previous frequency is automatically stored to the audiogram.

Test 1000, 2000, 3000, 4000, 8000, 500 and 250Hz.



When all the thresholds are obtained for the test frequencies required for the first ear, click *Left Ear* and repeat the procedure for the left ear.

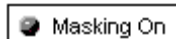
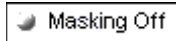
Bone Conduction



1. Click *Bone Conduction*.
2. Place the bone conductor on the poorer air conduction threshold ear. Remove the insert earphones.
3. Practice finding BC thresholds for 1000, 2000, 4000 and 500Hz.
4. Use the same technique to find threshold as used in air conduction testing.

The appropriate bone conduction symbol is automatically plotted to the audiogram.

Masking



When masking is required, click *Masking Off* to turn the masking narrow band noise on. The icon will now indicate Masking ON. Masking noise automatically routes to the non-test ear. Therefore, if you are testing right bone conduction and you select Masking, the masking noise automatically routes to the left insert earphone. Remember to place the air conduction insert earphone in the non-test ear for masking.

Set the masking level by adjusting the Mask level attenuator.

Turn masking off by clicking the *Masking On* icon. The icon will now say Masking OFF.

Discrete Frequency UCLs



1. To record discrete frequency UCLs, select *Inserts, UCL, Tone, and Continuous*.
2. Carefully instruct the patient in the task. The patient needs to know you will gradually turn the tone up until it momentarily reaches an uncomfortable level. This critical information is of great benefit in the hearing aid fitting.
3. Use the attenuator and tone presentation controls to gradually increase the tone until the patient indicates you have reached uncomfortably loud.
4. Find discrete frequency UCLs for as many frequencies as possible.

NOTE: Be aware that when you change test frequency, you will need to turn the attenuator down a little to begin testing. Otherwise, your first tone presentation will be close to UCL, which will startle the patient.

The symbol for UCL (U) is automatically recorded on the audiogram. A blue U reports the left ear UCL and a red U reports the right ear UCL.

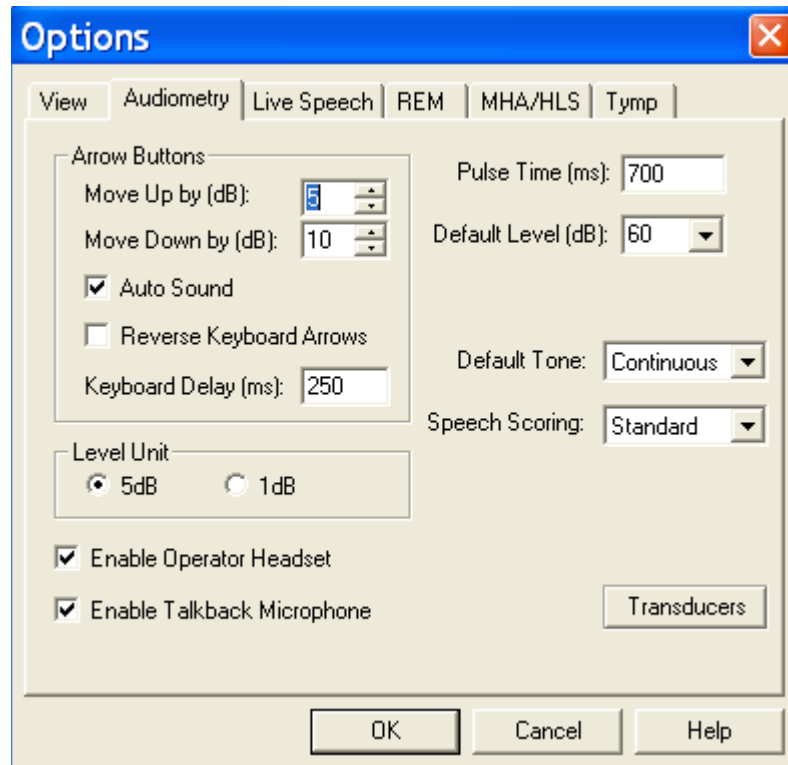
Customizing Audiometry

There are several ways to customize the Audiometry setup to suit your preferences. All customizing features are accessed from *Options* on the toolbar.

From the toolbar, go to **Options | Audiometry**.

Set the Default Ear to your preferred first ear to test.

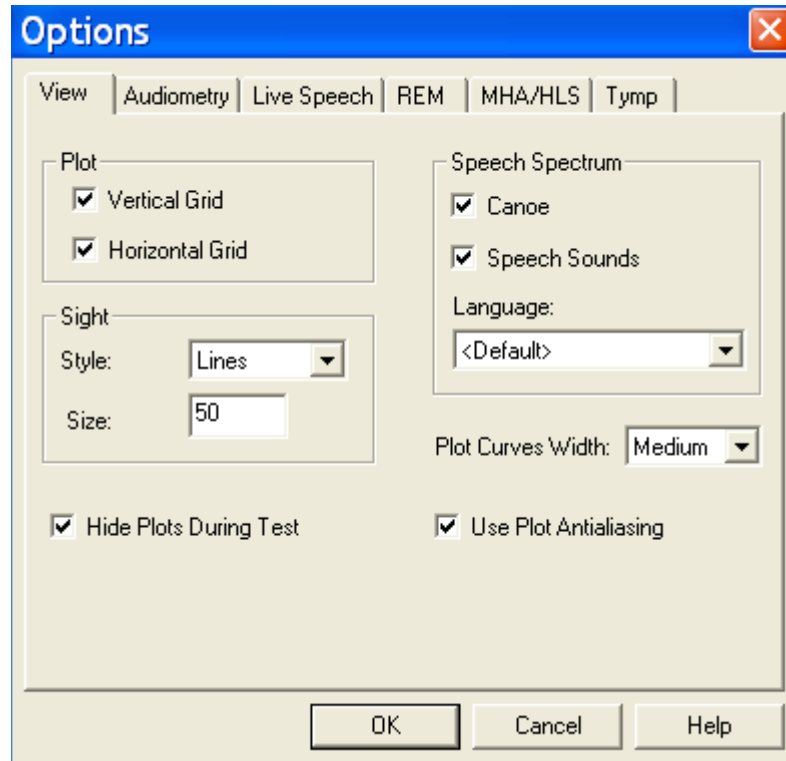
Click the *Audiometry* tab.



Features you can customize include: arrow icons (step size); Autosound; reverse keyboard arrows; Keyboard delay time; pulse time; default level; talkback level; enable operator headset and talkback microphone; Level increments; speech scoring (UK); default Tone; operator headset; talkback microphone and control of multimedia speakers.

Click *Help*. Read the description of all the audiometry properties. Close Help and make any changes to the setup to customize to your preferences.

Click the *View* tab. Properties you can customize include: speech spectrum - canoe and speech sounds; Plot curve width - thick, medium and thin. A check mark in the white box indicates the canoe or speech sounds will appear on the audiogram.



REMOVING UNWANTED DATA FROM THE AUDIOGRAM



To remove a whole curve, click the icons on the control panel corresponding to the data you want to remove. For example: click left ear, AC, AUD. Click *Discard*. All the left ear, air conduction values will be removed from the audiogram.

To remove discrete data points on the audiogram point the mouse to the unwanted value on the audiogram and right click the mouse button. This removes only a single data point on the curve.

Oops! I deleted the wrong data? How do I retrieve it?

Go to the *Tools* on the toolbar and select *Undelete*

Error messages for missing Hardware connections

Look for the following software indicators for missing hardware.

Insert Earphones not connected



Bone Conductor not connected



Circum Aural headphones not connected



Patient Response button not connected



Transducer not calibrated



SPEECH TESTING

Speech testing provides information about the accuracy of the audiogram. Results are also helpful indicators of how well a patient may do with amplification.

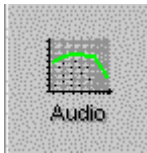
The two most common speech tests performed in a hearing evaluation are the Speech Reception Threshold (SRT) and Discrimination Score (DS) test (also known as Word Recognition tests).

Setup

Open a patient record from NOAH.

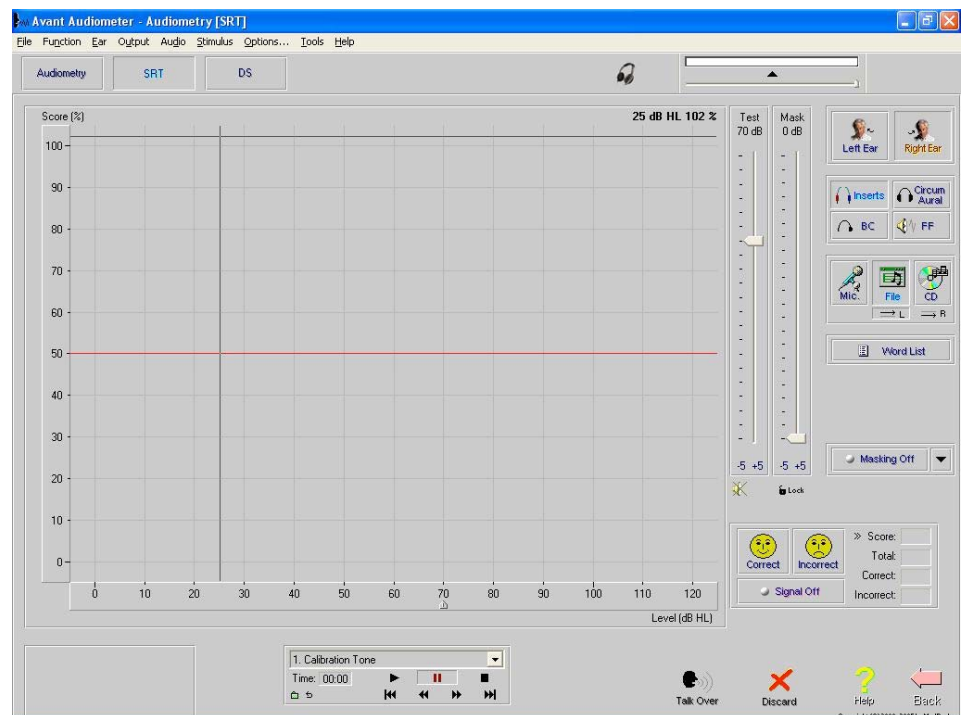
Open the AVANT.

Click *Audio* on the main menu.



SRT Speech Reception Threshold

Click *SRT* on the Audiometry taskbar.





Click the *Help* icon. Read the help topic for Speech Test Screen and become familiar with the SRT display and icons before proceeding with this exercise. Follow any link for further details.

Close the Help file to return to the SRT display.

SRT using WORDLIST feature

In addition to being a convenient method for the clinician, the Wordlist feature also involves a third party in the speech testing process. This feature allows the third party to see the speech test words "flash" on the screen before hearing the patient's response. This process provides real time counseling on how the hearing loss affects understanding speech.

Setup for Wordlist:



Click *Right Ear*.

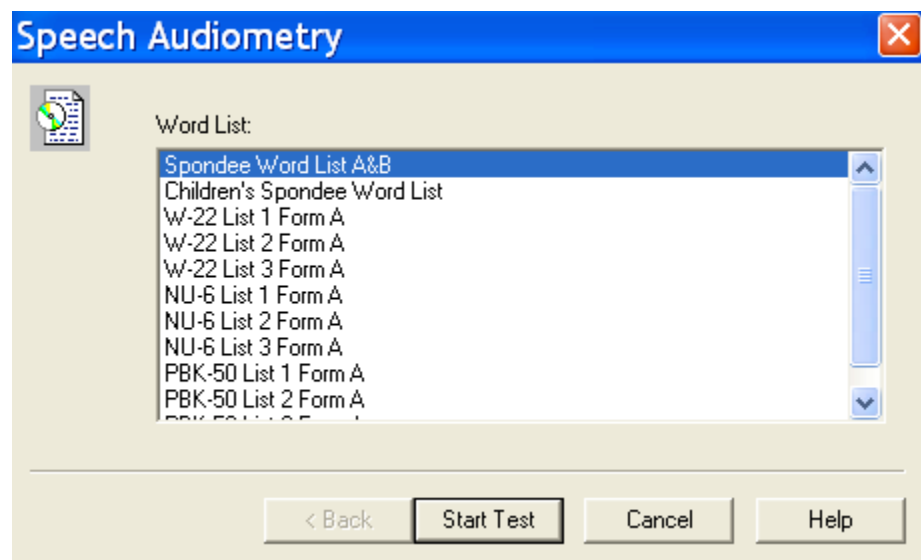


Click *File* on the control panel.



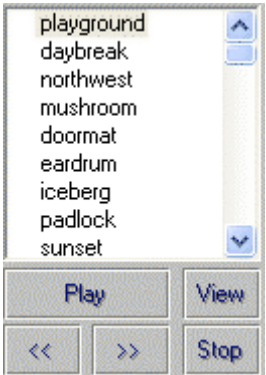
Click *Wordlist*.

Click *Spondee Wordlist A & B*.



Start Test

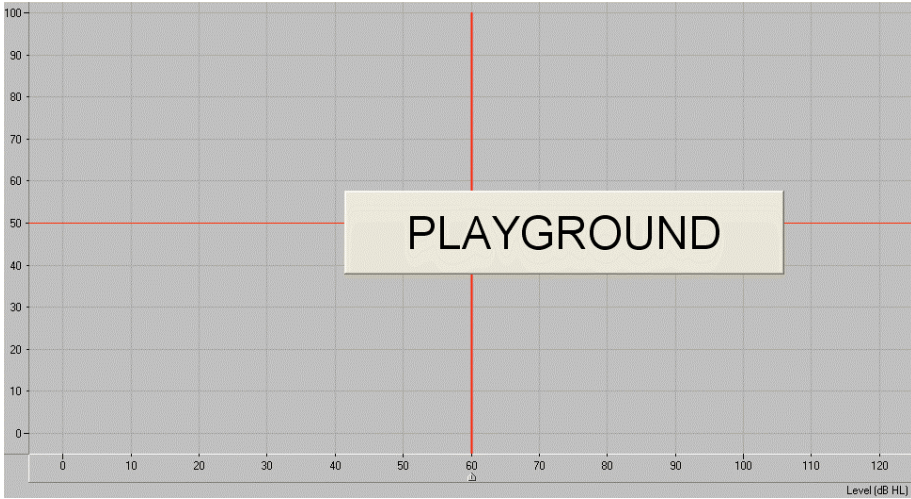
Click *Start Test*.



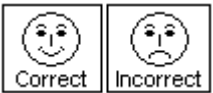
The Spondee wordlist now appears on the speech test control panel with the first word highlighted.

With the third party watching the screen, present the first word. To present the first word, click *Play* on the wordlist control panel or press *F9* on the keyboard.

The test word "flashes" on the screen.

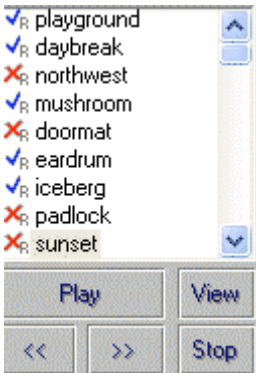


Listen to the patient's response.



Score the patient's response using either the *Correct* or *Incorrect* icons or the *F7* for correct or *F8* for incorrect.

Present each successive word on the list, scoring each response. Click the *forward* (>>) icon or press *F10* on the keyboard to move to the next word.



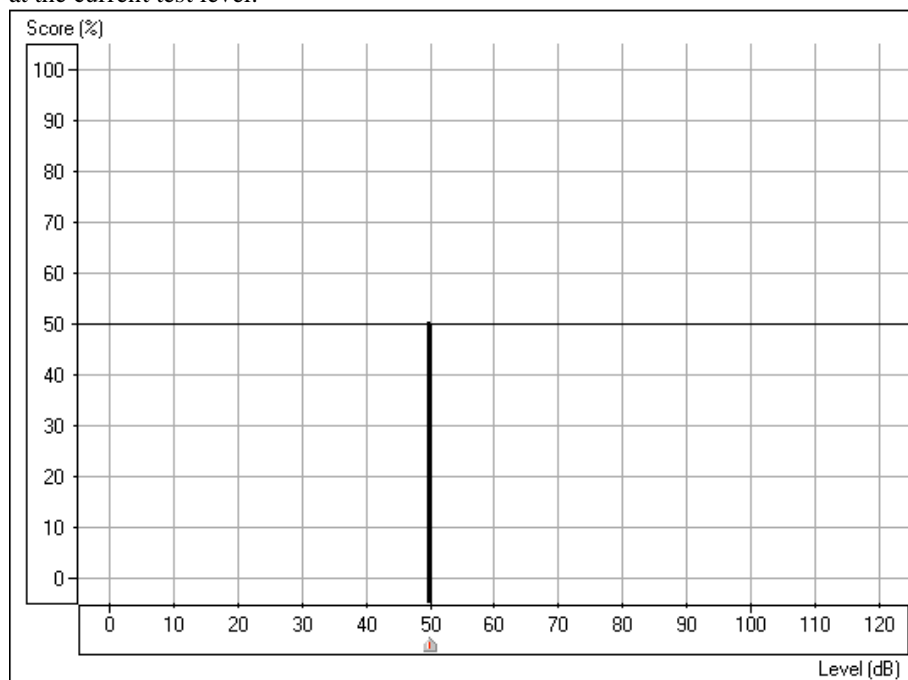
The test word is marked with a check or cross corresponding with the response provided.

The total score is updated automatically each time a response is scored as Correct or Incorrect.

Score:	50%
Total:	6
Correct:	3
Incorrect:	3

In this example, six words were presented at the current test level. Three responses were correct and three were incorrect for a Score of 50%.

The SRT display shows a "dynamic" vertical line on the grid to show percentage correct at the current test level.



In this example, the SRT score of 50% is recorded at 50dB.

Your aim in SRT testing is to find the lowest level at which the patient scores 50% correct. Adjust the test level as required to find this level. Each time you change the test level, the score automatically resets to zero.

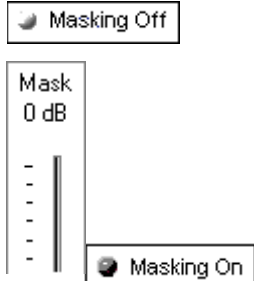
For example: Present the first 4 spondees. If the score is 75%, lower the presentation level and present another 4 words. If the score is now 25%, increase the presentation level and present more words. Continue to do this until you find the lowest level at which the patient scores 50%.



When SRT is determined for the right ear, click *Left* Ear and continue with the next word on the list. Use the PTA for the left ear to select a new start test level before presenting the next word.

Click *Stop* on the wordlist control panel to end the test. The word list is removed from the display.

Speech Masking



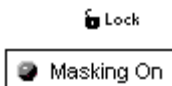
When masking is required, click *Masking Off* to turn the masking narrow band noise on. The icon will now indicate Masking ON. Masking noise automatically routes to the non-test ear. Therefore, if you are testing right bone conduction and you select Masking, the masking noise automatically routes to the left insert earphone. Remember to place the air conduction insert earphone in the non-test ear for masking.

Set the masking level by adjusting the Mask level attenuator.

Turn masking off by clicking the *Masking On* icon. The icon will now say Masking OFF.

Lock Masking Level to the Test Level

When masking, it is sometimes useful to determine a minimum masking level for a test level and then “lock” the masking attenuator to change with the test level. To do this, first set the attenuator to the test level and then determine the minimum effective masking level needed in the non-test ear and set the mask attenuator to this level. Now click the *Lock* icon and *Masking On*. All you have to do now is adjust the test level attenuator to find the masked threshold. The masking level will automatically adjust to the new test level as you seek threshold.



Using the CD controls for SRT Testing

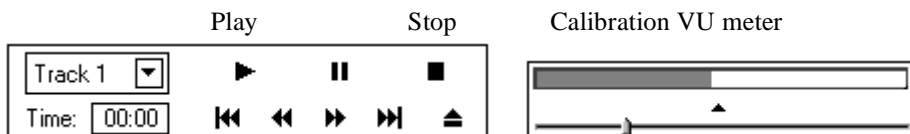
Use CD recorded material for foreign language CDs or other approved speech test wordlist material recorded on a calibrated CD.

Insert the wordlist CD into the CD ROM. (Auditec CD)



Click *CD*.

To calibrate the CD, click *Play* on the CD control panel. The first track on the CD is a 1kHz calibration tone. Look at the VU meter at the top of the display. The blue line on the VU meter needs to peak at the arrow marker. Adjust the level by dragging the *arrow* icon to the left or right as needed. Click the *Stop* icon on the CD control panel when calibration is successful.





Click *Right Ear* and *AC*.

Set the *Test dB* attenuator to the desired starting level.

Select *Track 2* on the CD. Track 2 is Adult Spondees.

Instruct the patient and insert the earphones.

Finding SRT



To start the test, click either *Play* on the CD control panel or *Signal OFF* icon. Signal OFF toggles to Signal ON when it is selected. These two controls operate interchangeably. Play is the same as Signal On and Stop is the same as Signal Off.

Monitor the test word by tracking the printed wordlist or by using the monitoring headset. Adjust the volume control to a comfort level when using the monitoring headset.

Monitor the patient's response. If you are using a two-way sound booth, you will have a talkback system in place to monitor the patient's response.

Scoring



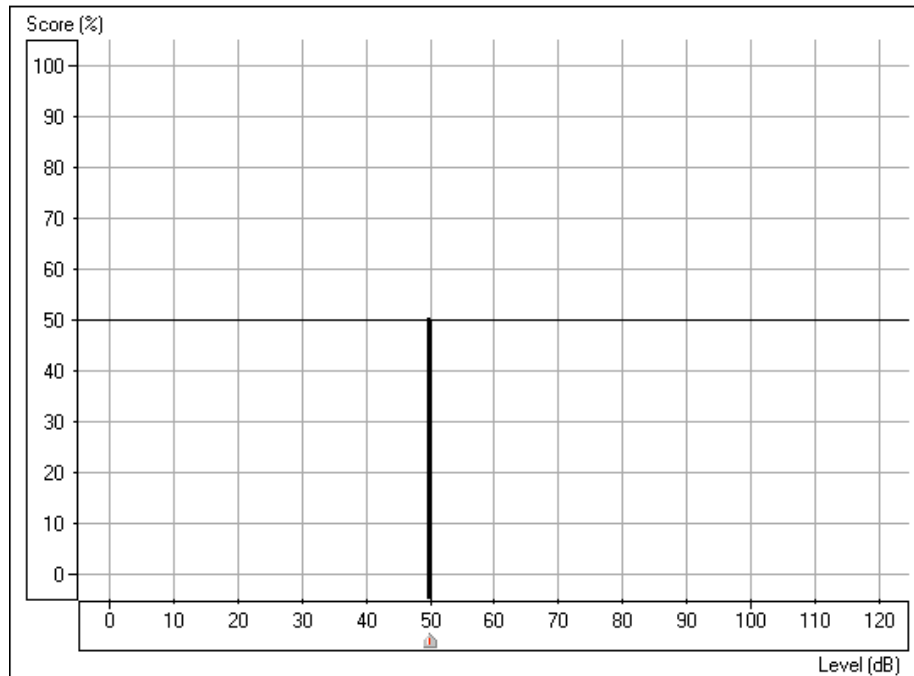
You can either use the mouse or keyboard to score the patient's response. Use the mouse to click the *Correct* or *Incorrect* icon for each response or press F7 for Correct and F8 for Incorrect on the keyboard.

The total score is updated automatically each time a response is scored as Correct or Incorrect.

Score:	50%
Total:	6
Correct:	3
Incorrect:	3

In this example, six words were presented at the current test level. Three responses were correct and three were incorrect for a Score of 50%.

The SRT display shows a "dynamic" vertical line on the grid to show percentage correct at the current test level.

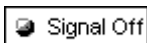


In this example, the SRT score of 50% is recorded at 50dB.

Your aim in SRT testing is to find the lowest level at which the patient scores 50% correct. Adjust the test level as required to find this level. Each time you change the test level, the score automatically resets to zero.

For example: Present the firAudiometer4 spondees. If the score is 75%, lower the presentation level and present another 4 words. If the score is now 25%, increase the presentation level and present more words. Continue to do this until you find the lowest level at which the patient scores 50%.

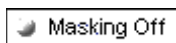
Use the *pause* icon on the CD control panel while you change the test level. You will not need to do this once you have practiced SRT testing as you will find you have adequate time between words to change the test level without pausing the CD.



Click *Stop* or *Signal Off/On* when the test is complete.

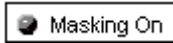
Find SRT for the other ear.

Masking



When masking is required, click *Masking Off* to turn the masking narrow band noise on. The icon will now indicate Masking ON. Masking noise automatically routes to the non-test ear. Therefore, if you are testing right bone conduction and you select Masking, the masking noise automatically routes to the left insert earphone. Remember to place the air conduction insert earphone in the non-test ear for masking.

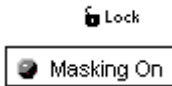
Set the masking level by adjusting the Mask level attenuator.



Turn masking off by clicking the *Masking On* icon. The icon will now say Masking OFF.

Lock Masking Level to the Test Level

When masking, it is sometimes useful to determine a minimum masking level for a test level and then “lock” the masking attenuator to change with the test level. To do this, first set the attenuator to the test level and then determine the minimum effective masking level needed in the non-test ear and set the mask attenuator to this level. Now click the *Lock* icon and *Masking On*. All you have to do now is adjust the test level attenuator to find the masked threshold. The masking level will automatically adjust to the new test level as you seek threshold.



Optional Activity:

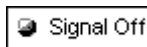
Live Voice Speech Testing



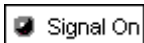
Click *Right Ear, AC* and *Mic*.

Position the microphone close to your mouth.

Set the *Test level* attenuator to 0dB.



To calibrate the microphone, click *Signal Off / On* icon. Speak at a normal voice level. It is useful if you repeat a spondee a few times over. Monitor the speech VU meter at the top of the display. The maximum energy of the spondee should peak at the calibration marker, where the blue line meets the red line. Adjust the VU meter using the *arrow* icon on the meter until the level is calibrated.



When you have calibrated the microphone, click *Signal Off / On* to turn the microphone off until you are ready to test. The icon should now display *Signal Off*.

Set the start level on the Test dB bar. You can use the PTA under Tools to guide you in deciding what level to start the test.

Click *Signal Off / On* when you are ready to present the first word. Remember to monitor your voice level on the VU meter and make sure you peak at the calibrated level. Score each patient response as correct or incorrect using the appropriate mouse or keyboard options.

Find SRT for each ear.

Turn the microphone off by selecting the *Signal ON / Off* icon to end testing,

Speech MCL

You will need to find the patient's Most Comfortable Level (MCL) for speech material before obtaining a discrimination score.

DS

Click *Discrimination Score* on the Audiometry taskbar.



Click *Help*. Read the help file on Discrimination Score. Become familiar with the task description, display and icons used in this test.

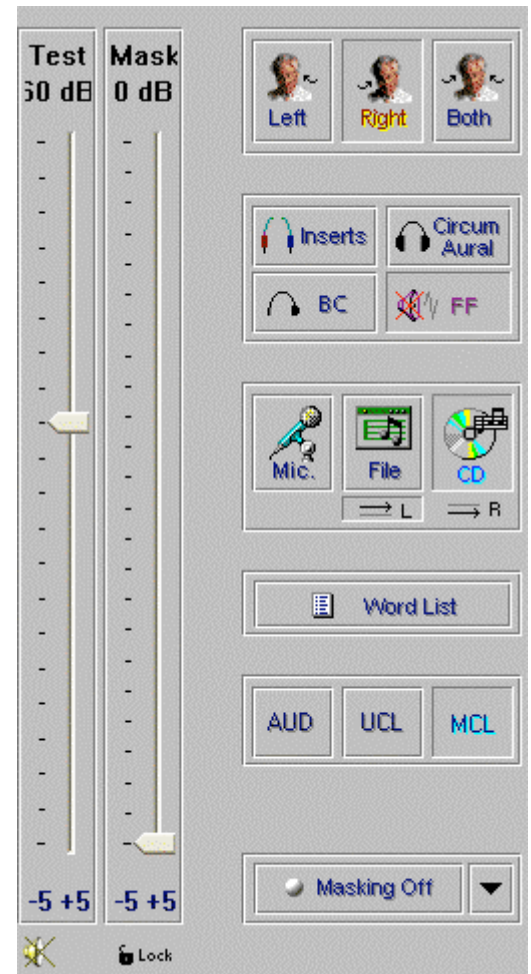
Setup for finding MCL using the Auditec CD

Click *Right Ear, Inserts, CD, MCL*.

Insert the speech CD into the CD-rom.

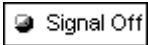
Set the *Test level* dB attenuator to 40dB.

Use the 1 kHz tone to calibrate the CD.



Select Track 14 on the CD control panel. This track plays continuous discourse, which is the preferred material for finding MCL.

Instruct the patient. Carefully explain to the patient that you will turn the volume up gradually. The patient needs to tell you when they can hear the voice at a comfortable level, similar to their preferred volume for the radio or television.



Click *Signal Off/On* icon or *Play* on the CD control panel.

Gradually increase the volume and monitor the patient's response. Choose one of the three methods to adjust the attenuator: Use the up arrow key on the keyboard or click the *arrow* icon on the attenuator bar or hold the mouse button down and drag the *arrow* icon slowly up the attenuator Test dB bar.



Look for the MCL (M) symbol on the bottom of the Discrimination Score results grid as it tracks with the attenuator.

When your patient indicates you have reached MCL, select the *pause* button on the CD player.



Click *Left Ear* and find MCL for the left ear.

You have now obtained the patient's speech MCL for each ear.

Binaural MCL



To find binaural MCL, click the *Both* icon.

Set each attenuator, Left and Right, to 5dB below the monaural MCL dB level determined previously.

Present Track 14 in the same manner as for monaural MCL, and adjust the Left and Right attenuators according to the Patient's perceived comfortable level.

Note: If you intend on finding a discrimination score at the patient's MCL, you may wish to stay with the right ear before switching to the left ear to find MCL. The next exercise takes you through the steps to obtaining a discrimination score at MCL.

Speech Score at MCL

It is useful to obtain a score of speech discrimination or word recognition at the patient's most comfortable listening level. The result provides an idea of how well the patient may do with amplification.

Setup

Using the Dynamic Wordlist presentation mode for Discrimination Score

Setup the control panel by selecting *Right, Inserts, File* and *AUD*.

Set the attenuator to the desired level.



Click *Wordlist*.

Select the Word list preferred, and *Start Test*. Example: select NU 6 or W22 wordlist.

Instruct the patient. Make sure you can hear the patient's response, whether you use a one room or remote microphone setup.

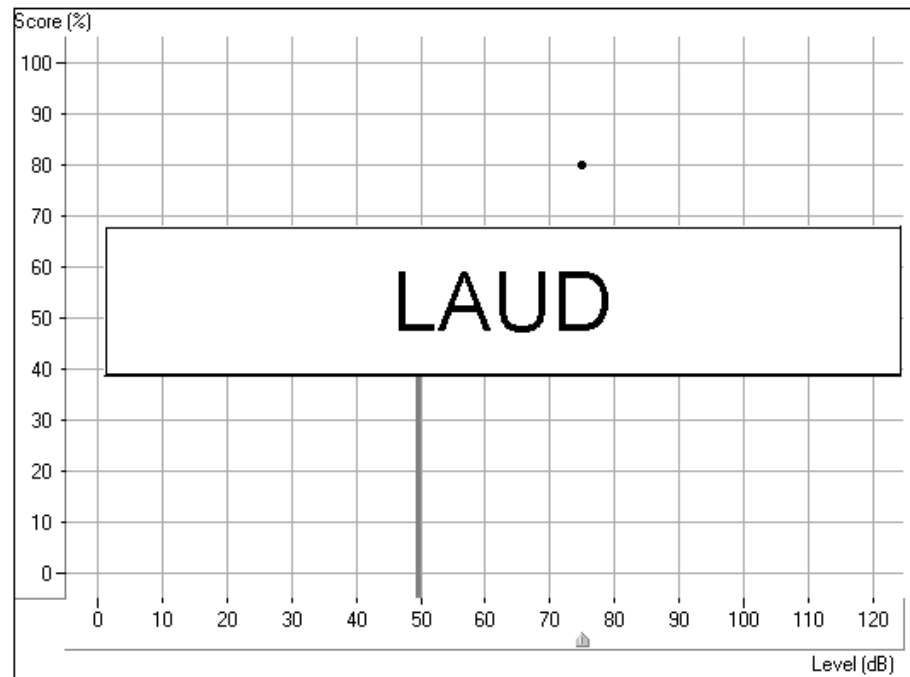
Make sure the insert earphones are inserted appropriately.

Note: If a third party is present, you may wish to use the Dynamic Wordlist presentation mode to present the test words. A special section at the end of this exercise steps you through this option. For now, follow the steps as described below.



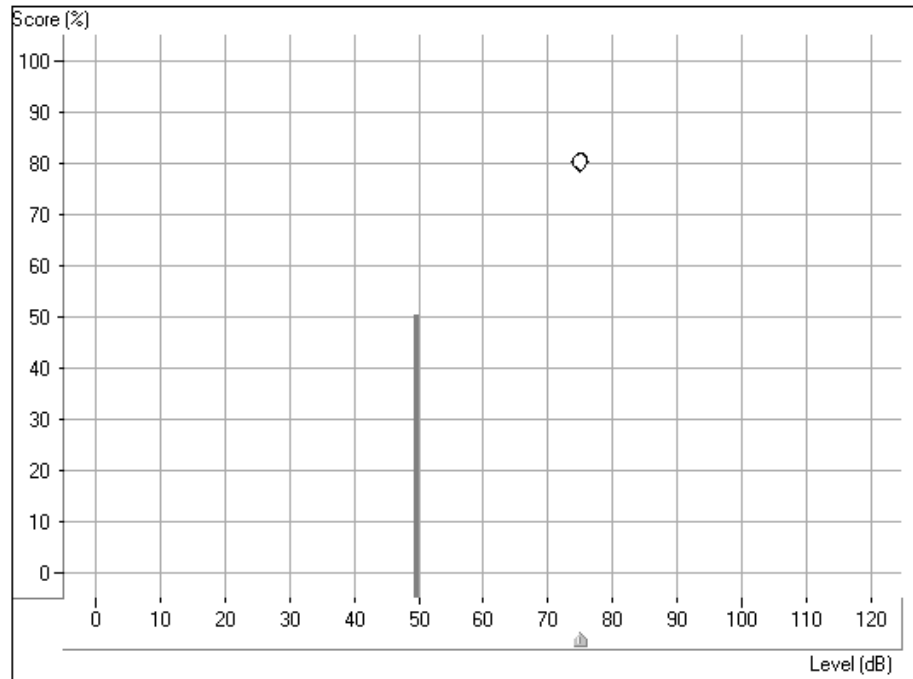
Click *Play* on the Wordlist control panel or press the *F9* key on the keyboard to present the first word.

The word appears in large text at the center of your screen.



Score the patient's response as correct or incorrect, using either the *Correct* or *Incorrect* icons or the *F7* or *F8* keys respectively.

The score is automatically plotted to the display and is continuously updated for each response. The score indicates the percentage correct at the test level.



In the above example, a discrimination score of 80% was obtained at a test level of 75dB.

The solid vertical line at 50dB represents the SRT for the same ear.

You can also monitor the status summary textbox under the control panel. This reports the current score, total number of words presented, number correct and number incorrect.

Score:	80%
Total:	20
Correct:	16
Incorrect:	4



Click *forward* or press *F10* on the keyboard to present each successive word on the list. Remember to score each response to a test word.

Present the desired number of words to obtain a Discrimination Score.

When the desired number of words has been presented, click *Stop* on the Wordlist control panel.

At this point, you may want to present more words at a new test level. Set the attenuator to the new level and click *Play* to proceed. A new score is obtained for the new test level.



Repeat the procedure for the Left ear.



Click *Stop* to end the wordlist test and return to the default control panel display.

View the Complete Wordlist scores for the patient

Click *Tools* on the toolbar.

Select *Speech wordlist/ View wordlist*.

A summary of how each word was scored is presented in a table for your review.

Left	Right	Both
↓ (60dB, 66%)		
✓ yard		
✓ carve		
✗ us		
✓ day		
✓ toe		
✗ stove		

DS Left: 67% at 60dB

Print Close

Using the CD controls for DS testing

Use CD recorded material for foreign language CDs or other approved speech test wordlist material recorded on a calibrated CD.

Click *Right*, *Inserts*, *CD* and *AUD*.

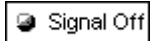
Set the attenuator to the MCL level determined in the preceding exercise.

Select your preferred wordlist on the CD control panel. Refer to the inside cover of the speech CD to locate the list of your preference.

Instruct the patient. Make sure you can hear the patient's response, whether you use a one room or remote microphone setup.

Make sure the insert earphones are inserted appropriately.

Note: If a third party is present, you may wish to use the Dynamic Wordlist presentation mode to present the test words. A special section at the end of this exercise steps you through this option. For now, follow the steps as described below.



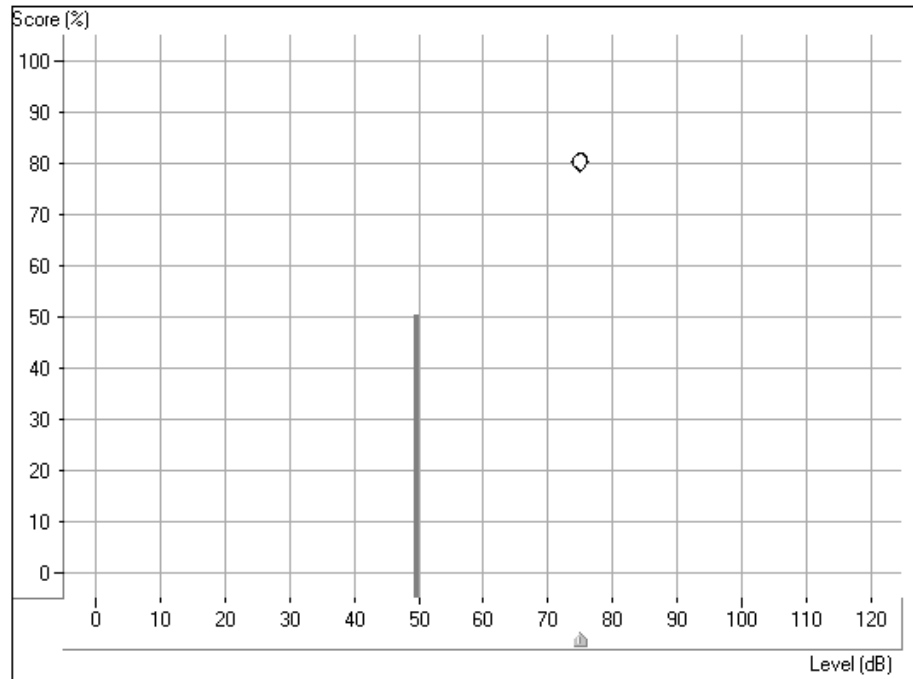
Click the CD control *Play* icon or *Signal Off/On* to start the test.



Monitor the test words by tracking the printed list of words or use the monitor headset.

Score each response. Click *Correct* or *Incorrect* or use the keyboard keys F7 for correct and F8 for incorrect.

The score is automatically plotted to the display and is continuously updated for each response. The score indicates the percentage correct at the test level.



In the above example, a discrimination score of 80% was obtained at a test level of 75dB.

The solid vertical line at 50dB represents the SRT for the same ear.

You can also monitor the status summary textbox under the control panel. This reports the current score, total number of words presented, number correct and number incorrect.

Score:	80%
Total:	20
Correct:	16
Incorrect:	4

When the desired number of words has been presented, click *pause* on the CD control panel.



At this point, you may want to present more words at a new test level. Set the attenuator to the new level and click *Play* to proceed. A new score is obtained for the new test level.

Repeat the procedure for the *Left* ear when you have finished with the right ear.

Binaural Discrimination Score



To obtain a binaural discrimination score, click the *Both* icon.

Adjust both the left and right attenuators to the desired input levels.

Select the wordlist track to be presented.

Score the patient's responses in the same manner as described in the previous monaural discrimination score task.

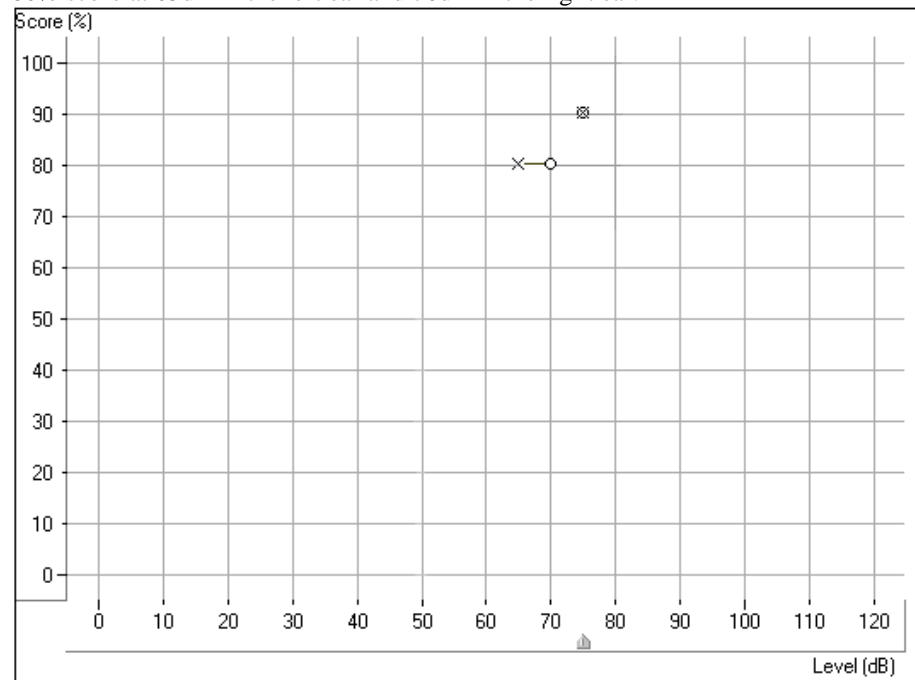
The test results are plotted to the grid in the following manner:

A red circle indicates the test level in the right ear and a blue cross shows the test level in the left ear.

The results in the diagram below are:

90% score at 75dB in both the right and left ear

80% score at 65dB in the left ear and 70dB in the right ear.



Speech UCL

While obtaining discrete frequency UCL data using pure tones is highly recommended in Audiometry, it is sometimes useful to obtain a UCL using speech material.

Setup for UCL

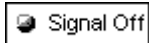


Click *Right Ear, Inserts, UCL* and *CD*.

Select Track 14 on the CD (continuous discourse)

Set the attenuator to the patient's MCL.

Instruct the patient carefully. Explain to the patient that you will turn the volume up gradually. The patient needs to tell you when they can no longer tolerate the sound, even for a few seconds. Look for the "crows feet" to appear around the patient's eyes.

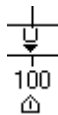


Click *Play* on the CD control panel or *Signal Off/On* icon.

Gradually increase the attenuator level until the desired UCL response is obtained. Choose one of the three methods to adjust the attenuator: Use the up arrow key on the keyboard or click the *arrow* icon on the attenuator bar or hold the mouse button down and drag the *arrow* icon slowly up the attenuator Test dB bar.



Immediately click the *Stop* icon on the CD control panel or the *Signal On/Off* icon when the patient indicates UCL.



The UCL level is indicated on the display as a U symbol below the discrimination score results grid.

View all Speech Test Results

A summary of the speech test results is displayed on the Audiometry screen.

Click *Audiometry* on the taskbar.

At the bottom of the screen, the speech test results are displayed in the following table:

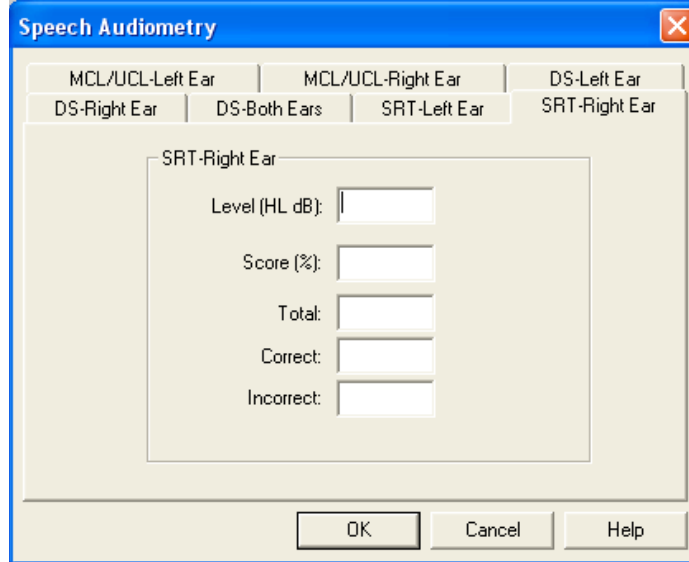
	SRT	DS	MCL	UCL
Left:	45dB	94% at 75dB	75dB	100dB
Right:	50dB	87% at 70dB	75dB	100dB
Both:	45dB	87% at 75dB	75dB	95dB

Note: The "best" scores are imported to this summary box.

Sharing Speech Test Results with NOAH

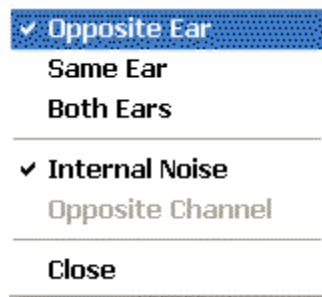
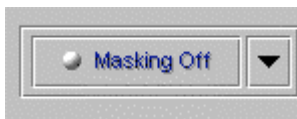
Speech test scores are stored to the NOAH database when the client folder is closed.

Manually editing or entering speech test scores from previous tests



Masking Options

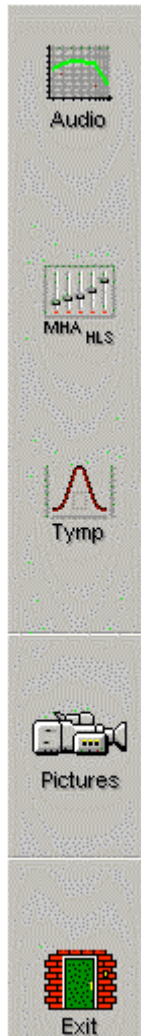
Further speech testing functions can be performed with speech masking in the Same ear or both ears. To access these advanced testing states, click the *arrow* icon next to the Masking setup on the control panel.



Select the masking option for advanced speech testing.

VIDEO OTOSCOPY

When the video otoscope is connected to the AVANT Audiometer™ USB port, the software menu option for *Pictures* is activated.



The *Pictures* menu allows you to capture and store images.

Stored images can be reviewed and edited.

Storing Video Otoscope Images



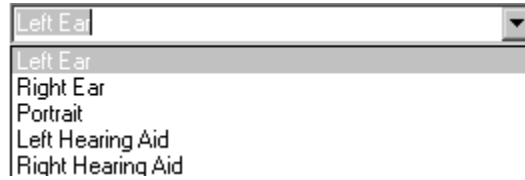
Click the *Pictures* icon on the main menu screen.



Click *Scope* icon to activate the camera.

You should see a full screen image. Adjust the focus and aperture rings on the camera to provide a good image on the screen.

Select a title for the image to be stored. Example: To select Portrait, click the down arrow icon and click on Portrait.



Click *Capture* to store the image.

Capture as many images as you like by returning to the active camera screen and selecting Capture again.



To view stored images, click the *Back* icon. Each captured image is listed by title in the Description column. Click on the title of an image to view the image.

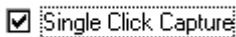
Comments can be added to each image. Select the title in the Description column to open the comments box for that image. Click in the comments box and type the desired text. Comments are stored with the image.

Easy keyboard method for capturing an image on the screen

Use the single click capture mode to capture the images.



Click *Scope*



Click the white box beside the words *Single Click Capture* on the taskbar.



Click *Capture*. All the screen icons are now inactive. (fade to gray)

Hit any key on the keyboard to capture the desired image. It is sometimes convenient to have the patient hit the keyboard for you, at your prompting. The spacebar is the most accessible key for the patient.

The captured image appears on the left of the screen and a description list on the right of the screen.

To deactivate the single click mode, click the right mouse button anywhere on the screen.

Sequence

To capture a sequence of images in the single click mode, check the white box beside *Sequence*, while leaving the single click captured mode selected also. This allows you to take a sequence of images of the same title each time the keyboard is struck.



When you have finished capturing images, click the *Back* icon to return to the stored image description screen to view images.



View a Stored Image

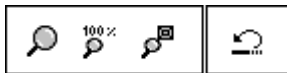
Click *Pictures* on the main menu screen to access the stored images.



Click the image to be viewed in the Description column.

Click *Open*.

Edit a Stored Image



When an image is opened, you can use any of the editing tools to enhance the image for better viewing. These tools include, *zoom*, *sharpen*, *smooth* and *shadow*. Each successive adjustment to the image can be deleted by using the undo icon on the toolbar.



Enhancements made to the image on this screen have no effect on the initial stored image. The original image remains in the database unchanged.

Practice using these tools. Click on each of the editing icons. *Sharpen*, *Smooth* and *Shadow*.

Undo all changes by clicking on the *undo* icon until the original image is restored.

Click *Back* to return to the stored image description screen.



Delete an Image

You can delete any unwanted image by clicking on the desired image listed under the Description column and clicking on *Delete*.

Print an Image

Make sure the printer has been installed and is turned on.

Click the image title to be printed from the list in the Description column.

Go to File on the toolbar and click Page Setup. **File | Page Setup.**

To customize the size of the image, choose the number of columns for the picture. The number one (1) prints the biggest image.



Click *OK*.

Go to File on the toolbar and click Print. **File | Print.**



Customize Properties as needed and click *OK*.

Rename An Image

If you want to give a stored image a different label, click on the title of the image to be renamed in the Description list and right click the mouse button. Select *Rename* and type the new label for the image.



Back

Exit Pictures

When you have finished taking images, click the *Back* icon to return to the main menu.

HEARING LOSS SIMULATOR AND MASTER HEARING AID

Hearing Loss Simulator

The Hearing Loss Simulator demonstrates the effect of the client's hearing loss for the spouse or family member. The program attenuates an input signal to simulate the audiogram. The spouse or family member listens to the free field speakers. The third party member can hear how their own voice is distorted by the hearing loss when the Record input option is used.

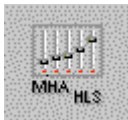
Setup



Open *NOAH* from the desktop.

Open the Client folder and select the client to be seen.

Click the measurement module (Ω) icon on the toolbar. The AVANT Audiometer™ main menu appears on your screen.



Click the *MHA / HLS* icon on the main menu.

Simulate the difference between normal hearing (Normal) and the patient's hearing loss (Simulate)

Setup for Hearing Loss Simulator

There are three tabs on the MHA/HLS taskbar. The first is AUDIO. This screen shows the patient's audiogram for the current record. It displays the data for the test ear selected on the control panel. If the current record has audiometric data, it will automatically import to this display.

Manual entry of audio data: If there is no audiometric data in the current record, you can manually enter the audiogram in the AUDIO screen. Click *Right Ear* and *AC* on the control panel and simply point the mouse to the value on the audiogram, example 30dB at 1000Hz, and click the mouse button. The appropriate AC symbol for right ear air conduction threshold is plotted to the audiogram. Click *Left Ear* and enter air conduction values for the left ear.

For the purposes of this exercise, enter the following audiogram values for the *Right Ear*:

20 at 250, 30 at 500, 40 at 1000, 50 at 2000, and 60 at 3000, 4000, 6000 and 8000Hz.



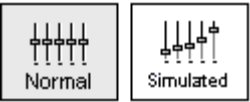
Click the *HLS* tab on the taskbar.



Click *Help* and read about Hearing Loss Simulation. Follow the link to the Hearing Loss Simulator icons and become familiar with the icons used in this demonstration.



Click *Right Ear*, *Normal*, and *File*. File input option accesses the audio track stored on the system hard drive. The MedRx Sounds Sensations CD in on File.



Make sure the speakers used by your system for the Hearing Loss Simulator are connected to the system and turned on.



Select *Track 2* on the CD control panel.

Explain the audiogram to the third party. Pay special attention to the speech area.

Explain the simulation activity. First, the third party will listen to music in the Normal mode. When you click Simulated, the third party will hear the music adjusted for the patient's hearing loss.

Position the third party so that they are near the speakers and can view the monitor easily.



Click *Play* on the CD control panel.



Adjust the volume control if the third party has difficulty hearing the music. Click *-5* or *+5* icons to increase or decrease the volume respectively. In most cases, you will not need to adjust the volume.

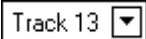
Allow the third party to listen to the music for 20 – 30 seconds, reinforcing that this is how the third party normally hears this music.



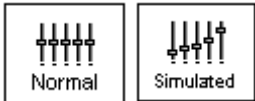
Click *Simulated*. Tell the third party that they are now listening to the patient's hearing loss.



Alternate between *Normal* and *Simulated* for the third party to appreciate the difference.



Repeat the simulation with *Track 13*, which is a female voice in quiet.



Alternate between *Normal* and *Simulated*.

This provides a good demonstration of why the patient says the third party "mumbles". The hearing loss makes it sound like the female voice is mumbled.

The next track demonstrates how the patient's hearing loss can affect their safety.

Track 15 ▾



Select *Track 15* and click *Simulated*. Press *Play* on the CD control panel and ask the third party to identify the sound. It will take some time until the third party recognized the approaching train whistle.



When they have identified the sound, press *stop* and replay track 15 in the normal mode. Click *Normal* and then *Play*.



This is an effective demonstration of how the patient may not be hearing important environmental sounds for safety.

Use a familiar voice for Hearing Loss Simulation

This is a wonderful demonstration for the third party to hear how "mumbled" they sound to the hearing impaired person.

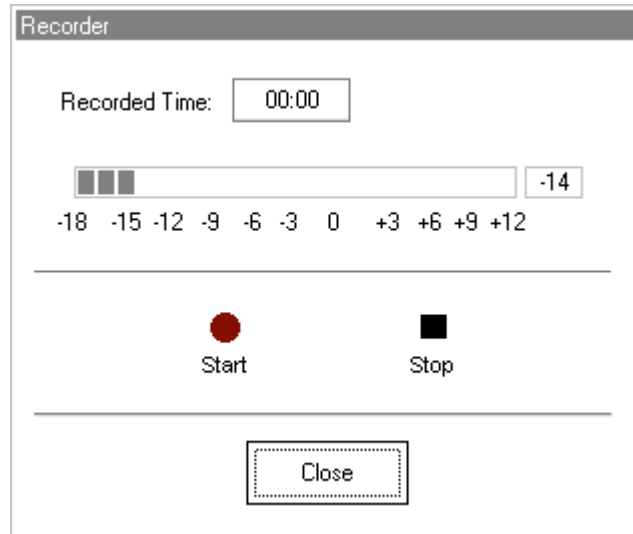
Have the third party record their own voice and play it back through the simulator.



Select *Record* on the HLS control panel. A new control panel appears on the display below the audiogram.



Click on the red circle icon.



The talkover microphone is activated, although there is no output to the speakers as yet. Have the third party member practice speaking the intended speech sample into the microphone. Aim to peak the voice effort at zero on the active VU meter.

When practice is successful in maintaining a consistent input level, click the *Start* icon (red circle) and begin recording.

note: you can adjust the microphone level using the Talkover volume control on the front of the AVANT Audiometer™.

When finished, click the *Stop* (black square) icon.

The Record Time will be displayed to show the length of the recording in seconds.

If you are satisfied with the recording click the *Close* icon. If you are not satisfied, simply repeat the process of recording a new sample of speech, then click the *Close* icon.

To play the recorded speech, click the Play icon on the control panel.

Allow the third party member to experience the recording under the *Normal* and *Simulate* conditions.



Use the *track return* icon on the control panel to replay the recorded sample continuously.

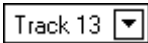
Simulate the potential improvement in the patient's hearing performance when hearing instruments are worn

This also provides an opportunity to set the third party's expectations for the benefits and limitations of hearing aids.

Setup



Click *Simulated*. Select *Track 13* on the File control panel. (Make sure *File* is selected as the input signal)



Explain that you are now going to simulate the potential improvement a hearing aid can make to the patient's hearing.



Click *Play*.

The third party is listening to the female speaker on Track 13, adjusted for the hearing loss. Improve the patient's thresholds by applying a half gain rule to the audiogram values. Simply point and click on the audiogram to the improved threshold level.

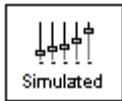
For example: For the hearing loss entered in this lesson, you will now point and click to 10 at 250, 15 at 500, 20 at 1000, 25 at 2000 and 30 at 3000, 4000, 6000 and 8000Hz.

You do not need to be precise in this step as you are performing a “simulation” of the potential benefit.

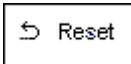
As you improve the threshold at each frequency, the female's voice becomes clearer.



At this point, click the *Normal* icon. Explain to the third party that while you can dramatically improve the hearing performance with hearing instruments, it is still not normal hearing.



With the track still playing, click *Simulated* again. Remind the third party that with the hearing aid, the patient hears better than without the hearing aid. To demonstrate this, click the *Reset* icon on the control panel. This resets the audiogram to the patient's original hearing loss values.



You can repeat this simulation with a variety of tracks on File.

This simulation provides the third party with the experience and understanding that hearing instruments have great potential to benefit the patient. It also helps the third party not to expect the patient to have normal hearing, even with hearing instruments.

Simulate the natural deterioration in thresholds over time

This simulation helps consolidate your recommendation for the patient to be fitted with the flexibility of programmable technology, which allows the hearing instrument to "grow" with the hearing loss for the life of the instrument.

It is useful to simulate the effect of a drop in the patient's hearing. Most presbycusis hearing losses are characterized by gradually declining hearing thresholds. It is not unusual to see a drop of 5 to 10dB in thresholds over a 3 year period. This simulation is used in conjunction with your recommendation to fit programmable hearing instruments that can be adjusted for changes in hearing levels for the life of the hearing aid. This adds validity to the added cost of high end program hearing instruments.

Setup



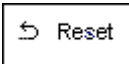
Click *Simulated*.

Select your preferred track on File.



Click *Play*.

Manually change the audiogram thresholds by 5 -10dB for all frequencies across the frequency range. Simply point and click the mouse to a threshold 5dB below the current threshold on the audiogram. While this does not "appear" to be a significant change on the audiogram, it is usually enough of a drop in hearing performance for the third party to hear.

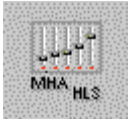


To return to the original audiogram, click the *Reset* icon.

MASTER HEARING AID

It is highly recommended you use stock demonstration hearing aids as Master Hearing Aids whenever you have them available. Providing the patient with the experience of listening to a "real" hearing instrument is a superior demonstration to a master hearing aid. However, the Master Hearing Aid provided in the AVANT Audiometer™ is a quick way to simulate the potential benefit of hearing instruments to a patient who has never worn hearing aids before. It is recommended you use the MHA for mild and moderate losses only.

Setup



Click the *MHA / HLS* icon from the main menu screen.

The first screen is AUDIO. If you do not have a current patient record open, manually enter air conduction thresholds for one ear on the audiogram.

For the purpose of this exercise, enter the following audiogram for the *Right Ear*:

20 at 250, 30 at 500, 40 at 1000, 45 at 2000, 50 at 3000, 55 at 4000, 6000 and 8000Hz.

Enter the same values for the Left Ear.



Click *MHA* on the taskbar.

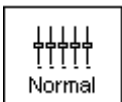


Click *Help* and become familiar with the screen and icons for Master Hearing Aid.

Close the Help file from the X icon to return to the Master Hearing Aid exercise.



Select *Right Ear*.



Select *Normal*.

The program automatically reads the patient's audiogram data and plots gain curves to the display. The default gain rule applied to the thresholds is the NAL(R) rule. This rule applies well to most hearing losses for comfort level hearing.

Exceptions: For very mild hearing losses, select the 1/3 Gain rule.

For very severe hearing losses, select the 1/2 Gain rule.

A gain curve is plotted for each ear. The highlighted (green) curve is determined by which test ear icon you have selected on the control panel.



Click either the *File* or *CD* icon. File accesses the stored audio tracks on the system hard drive. The MedRx Sounds Sensations CD is on File. If you use the CD, make sure the audio CD is in the CD ROM before selecting the CD input. This option provides you with greater variety and control of the sounds used in the simulation.



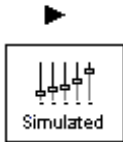
Click *Binaural*. This allows the prescribed gain to go to each ear simultaneously, to simulate a binaural fitting.

Instruct the patient. The patient will begin by hearing the sound unchanged. When you click the Simulated icon, the patient will hear the simulated hearing aid effect on the sound.

Place the insert earphones on the patient.

Position the patient so that they can view the monitor.

Select the desired track on File or if using the CD, select the preferred track and press *Play*.



Allow the patient to listen for a few seconds, then click *Simulated*.

Continue presenting the signal.

The patient should now be able to notice a significant change in the clarity of the signal.

Repeat this simulation using a variety of CD tracks.

Use Familiar voices for MHA by selecting the Record input option

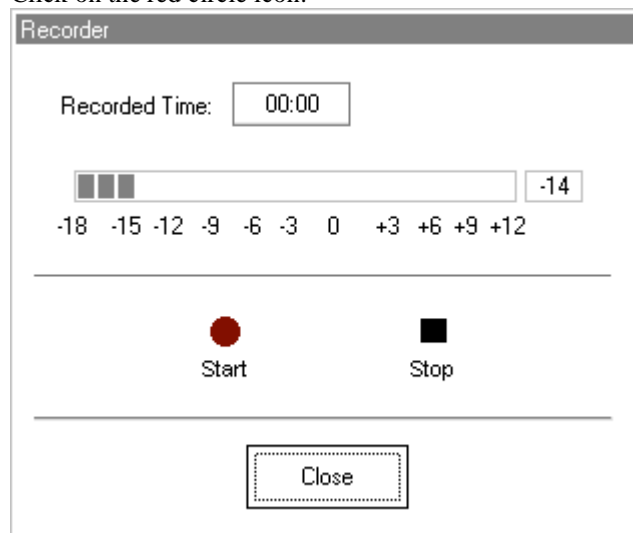
Use the third party's voice recording for the MHA demonstration.



Select *Record* on the MHA control panel. A new control panel appears on the display below the audiogram.



Click on the red circle icon.



The talkover microphone is activated, although there is no output to the speakers as yet.

Have the third party member practice speaking the intended speech sample into the microphone. Aim to peak the voice effort at zero on the active VU meter.

When practice is successful in maintaining a consistent input level, click the *Start* icon (red circle) and begin recording.

note: you can adjust the microphone level using the Talkover volume control on the front of the AVANT Audiometer™.

When finished, click the *Stop* (black square) icon.

The Record Time will be displayed to show the length of the recording in seconds.

If you are satisfied with the recording click the *Close* icon. If you are not satisfied, simply repeat the process of recording a new sample of speech, then click the *Close* icon.

To play the recorded speech, click the *Play* icon on the control panel.

Allow the patient to experience the recording under the *Normal* and *Simulate* conditions.

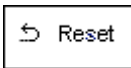


Use the *track return* icon on the control panel to replay the recorded sample continuously.

Based on the patient's subjective response as to "how it sounds", you can make adjustments to the simulation by 1) editing the gain curves and/or 2) comparing monaural to binaural amplification.

1) Editing the Gain curve to customize the Master Hearing Aid

Adjust to comfortable volume: If the patient does not think the Simulated mode is comfortably loud in each ear, adjust the overall volume level using the +5 or -5 icons.



Sound is too "tinny"?: If the patient reports that the signal is too "tinny", you can reduce the high frequency gain or increase the low frequency gain by editing the gain plot on the display. To do this, select the ear icon to be adjusted and simply point to the preferred level of gain on the gain curve at any given frequency and click the mouse button. The gain curve plot changes to the new level. Make appropriate changes to the other ear gain curve. Monitor the patient's response as to how it sounds. At any time, to return to the original prescription gain levels, select the *Reset* icon.

Comparing a monaural to a binaural fitting using master hearing aid



The AVANT Audiometer™ Master Hearing Aid task automatically assumes a binaural fitting and applies gain for each ear. If you want to demonstrate a monaural fitting, either as a comparison to the binaural fitting or because only one ear is aidable, click the *Monaural* icon and proceed with the Simulate versus Normal demonstration outlined above. The non-test ear will not receive any stimulus.

TYMPANOMETRY AND REFLEXES

Tympanometry

Tympanometry reflects change in the physical properties of the middle ear system and tympanic membrane (TM) as air pressure in the external ear canal is varied. Tympanometry requires an airtight seal between the probe and external ear canal walls. Air pressure, measured in deca Pascals (daPa), is varied positive and negative relative to atmospheric pressure and the dynamic effects of air pressure changes on the acoustic impedance properties of the middle ear are measured.

The graphic representation of acoustic impedance as a function of ear canal pressure is called a **tympanogram**.

Tympanometry is used to identify and classify middle ear disorders. Tympanometry and reflex testing can also be included in a test battery to reveal information on specific disorders of the auditory brainstem and peripheral auditory nervous system.

Getting Started

Please read the User Guides supplied with the tympanometer hardware.

Connect the receiver provided with the tympanometer according to the tympanometer manuals. You may need to set up the tympanometer itself (e.g. serial port baud rate) to communicate with the receiver.

To make the AVANT ST™ use the tympanometer, start the AVANT ST™ program and choose **File | Advanced Options | Tympanometry** from the main menu screen.

From the drop-down box choose the type of tympanometer. Click on **Setup** and make sure the communication options match the tympanometer hardware settings.

Tympanometry

Read the tympanometer hardware manuals to learn how to operate the tympanometer.

Click the *Tympanometry* icon from the main menu.



After an otoscopic examination of the ear and determination of an unobstructed ear canal and absence of discharge, select an appropriate sized, clean probe tip and attach it to the tympanometer.

Instruct the patient to keep still while the probe is in the ear canal.

Insert the probe to achieve an airtight seal.

Perform the test according to hardware manual instructions.

When the test is complete, transmit the data to the AVANT Audiometer™ (read the tympanometer manuals on how to transmit data). Some tympanometers may require you

to push the *Transmit* button on the screen (if such button is available) to activate the data transfer, while others do the transfer automatically.

INTERPRETING TYMPANOMETRY RESULTS

The graphic representation of acoustic impedance as a function of ear canal pressure is called a *tympanogram*. The tympanogram is displayed as volume in cubic centimeters (cc) of movement as a function of pressure (daPa). Note: One cubic centimeter is equivalent to one milliliter.

The data table charts the *ear canal volume*, *middle ear pressure* and *static compliance*.

Ear Canal Volume: cc

Middle Ear Pressure: daPa

Static Compliance: cc

Ear canal volume: is the volume of the external ear canal measured at +200daPa when the tympanic membrane is most taut.

Middle ear pressure: is the pressure of the middle ear at which peak compliance is determined.

Static compliance: is the resting compliance of the middle ear and is calculated at the peak compliance minus the external ear canal volume.

INTERPRETING THE TYMPANOGRAM

Type A

The shape of this tympanogram shows that there is less middle ear movement when the middle ear system is stiffened when air pressure is varied from atmospheric pressure. The middle ear system moves best at atmospheric pressure (0daPa). A Type A tympanogram shows normal middle ear function.

The normal compliance (movement) limits for a type A tympanogram are: 0.3 -1.6cc.



Type AS

A Type AS is a shallow Type A tympanogram with a peak compliance less than 0.3cc. This pattern is consistent with otosclerosis and some cases of middle ear effusion.



Type Ad

A Type Ad is a deep Type A tympanogram with a peak compliance greater than 1.6cc. This pattern is consistent with a flaccid, intact tympanic membrane or ossicular discontinuity.



Type B

A Type B has a "flat" tympanogram configuration., indicating little change in middle ear movement with changes in ear canal pressure. There are two types of Type B tympanogram, each determined by the ear canal volume.

Low volume Type B

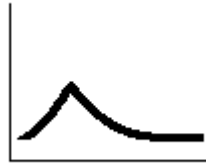
The low volume type B tympanogram is consistent with middle ear effusion.

High volume Type B

The high volume Type B tympanogram is consistent with a perforated tympanic membrane or patulous ventilation tube.

Type C

A Type C tympanogram shows peak movement at significant negative pressure ($< -100\text{daPA}$). This is most often consistent with Eustachian tube dysfunction.



Reflexes

Stapedial reflex measures form a valuable component of impedance testing. The stapedius muscle, attached to the stapes in the middle ear, contracts in response to a loud acoustic signal. This response is termed the acoustic stapedial reflex and is often abbreviated to AR. The AR occurs bilaterally which means it can be elicited by an acoustic signal presented to either ear.

The AVANT Audiometer™ is designed to measure ipsilateral acoustic reflexes, meaning the reflex is measured in the same ear as the acoustic signal is produced.

The probe measures changes in the middle ear impedance when a loud sound is presented. The stapedius muscle contracts with the loud sound and causes an increase in acoustic impedance at the tympanic membrane during the contraction. Resulting acoustic reflexes are dependent on an intact, normal middle ear system and an intact afferent (sensory) and efferent (motor) neural system associated with the stapedius arc. Abnormalities in any of these systems results in abnormal AR measures.

The AVANT Audiometer™ screens for the presence or absence of an AR at 500, 1000, 2000 and 4000Hz at 95dBHL.

Acoustic Reflex Testing

Note: Some tympanometers may perform the Tympanometry and the reflex tests at one pass. Please consult the hardware manuals.

Please read the tympanometer User Guide for instructions on how to operate the hardware for Acoustic Reflex measurements.

Select an appropriate sized, clean probe tip and attach it to the tympanometer.

Select *Reflexes* on the taskbar.

Tell the patient to expect a series of loud, but not uncomfortable, tones in the test ear. No response is required from the patient to these tones.

Instruct the patient to keep completely still during testing.

Insert the probe and maintain an airtight seal.

Press and hold down the small AR test button on the HandTymp, keeping your hand steady while testing.

Perform the test according to hardware manuals.

When the test is complete, transmit the data to the AVANT Audiometer™ (read the tympanometer manuals on how to transmit data). Some tympanometers may require you to push the *Transmit* button on the screen (if such button is available) to activate the data transfer, while others do the transfer automatically.

INTERPRETING AR RESULTS

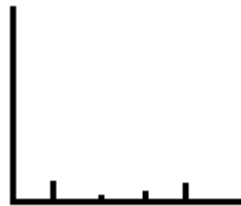
The AVANT Audiometer™ displays the AR data as the size of the reflex (in cc) for each frequency tested.

Since the AVANT Audiometer™ is designed to make a screening test for AR, the results should be interpreted for the presence or absence of an acoustic reflex.

There are two outcomes possible:



Acoustic reflexes of equal and moderate strength measured for all frequencies are consistent with normal middle ear function.



The absence or presence of very small reflexes. This outcome is consistent with either middle ear disorders, high reflex thresholds or lack of integrity of the neural arc for acoustic reflexes.

Note: An unsteady hand during reflex testing can yield anomalies in test data, such as a reflex at only one frequency. Repeat the test to achieve accurate data and transmit the data to the AVANT Audiometer™. The new data will overwrite the old data.