SOFTWARE TRAINING MANUAL

INTRODUCTION

Congratulations!

Your decision to incorporate the MedRx REM Speech™ into your daily practice will greatly assist you in delivering quality professional hearing health care services. The MedRx REM Speech™ is designed for easy use and equips you with excellent counseling tools to interact with the patient and family.

Setup and Install the MedRx REM Speech™ by following the installation documentation provided with your system.

How to use the Training Manual

To become proficient at using the MedRx REM Speech™, you need to invest some time in learning the software. This Training Manual provides training lessons to step you through the main functions of the software. It is highly recommended you complete these lessons before using the system with a patient. Repeat a lesson to refresh your performance as needed.

The first lesson "Getting Started" provides basic operation guidelines and an introduction to the software. The subsequent lessons are presented in corresponding order with the main menu. Return to a specific lesson if you need more practice with a specific task. For quick reference to a specific task, use the contents index at the front of this manual. Remember to use the Help provided in the MedRx REM Speech™ software for further details when they are required.

YOU ARE COMMENDED FOR YOUR EFFORTS TO DELIVER SUPERIOR HEARING HEALTH CARE.

Special Note: At present , the 3 Dimensional Live Speech Mapping menu is being used for research to develop clinical applications for your use. It is offered in the software for you to experiment with at you convenience.

LESSON ONE

Getting Started

It is assumed you have a working knowledge of hearing health care and hearing aid dispensing. You must have a basic understanding of hearing instrument fitting supported by real ear measurements.

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.

ABOUT THE SOFTWARE

THE MAIN MENU SCREEN

<u>REM SPEECH ™ SOFTWARE MENU</u>

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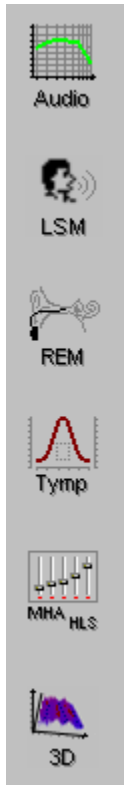
AUDIO   Audiogram

LSM   Live Speech Mapping

REM   Real Ear Measurements

TYMP   Tympanometry

MHA/   Master Hearing Aid and Hearing Loss Simulator
HLS

3D   3 Dimensional Live Speech Mapping

An additional icon for Video Otoscopy appears on the main menu screen when the additional VO software is installed on the REM Speech™.

<u>BASIC SCREEN DESCRIPTION</u>

The layout of every screen is consistent throughout the program. The following diagram and text describes this common format. Please <u>read </u>the following paragraph. Do not click on any icons until indicated with *italics.* Try to locate features as they are described.

Click *MHA / HLS* on the main menu.

You should see the following diagram on your screen.

Identify each basic feature of the display format.

MHA | HLS DISPLAY

Title bar
Toolbar
Taskbar

Control
Panel

Results

Help

Back

legend
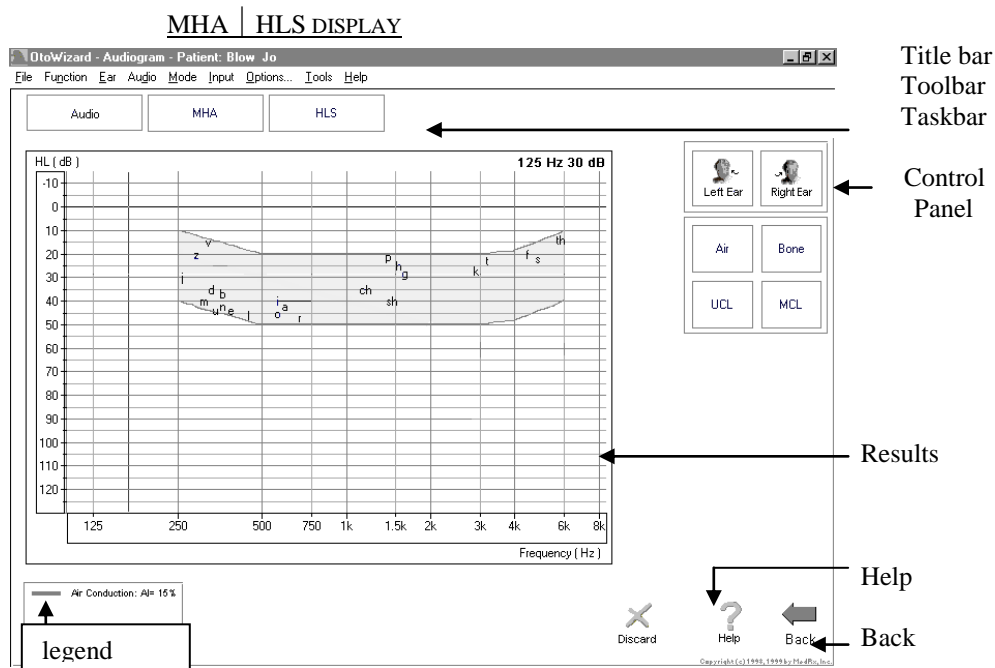
SAVING DATA

Results are automatically stored to the NOAH database when you close a client's folder in NOAH.

EXITING THE REM SPEECH™

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

CALIBRATION

The microphones are calibrated annually. Guidelines for microphone calibration are provided by your supporting technician for the REM Speech™.

Probe Tube Calibration:

CALIBRATE THE PROBE TUBE EACH TIME A NEW TUBE IS USED.
IT IS RECOMMENDED YOU USE A NEW TUBE FOR EACH PATIENT.

From the main menu toolbar, select **Functions/ Calibrate / Probe Tube**.

Follow the instructions to position the tip of the silicon tube against the free field microphone of the probe microphone assembly. Slide the elbow half way along the tube to help hold it in this position. While holding the probe tube assembly from the top of the earhook, hold the assembly half to one (1/2 -1) meter from the loudspeaker at an angle of 90 degrees (duplicating the natural position of the probe microphone assembly as it sits on a patient's ear during testing).

Probe microphone assembly:

The arrows indicate the tip of the probe tube and the free field reference microphone. The tip of the tube needs to rest against the free field reference microphone for calibration of the probe tube.
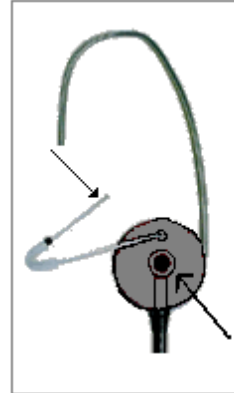
Click *Start*.

Adjust the speaker volume control until a level of 65 dB is reported in the reference level window.

The new curve should closely resemble the stored curve on the screen. If it is significantly different, inspect the probe tube for defects, replace the tube with a new one if necessary and repeat the test.

LESSON ONE

Operating the REM Speech ™ from within NOAH

There are two ways of running the REM Speech ™ software. The first is as a stand-alone program from the desktop. The second, and recommended method, is to run the REM Speech ™ within NOAH.

The advantage of running the REM Speech ™ from within NOAH is the efficiency of performing "real time" real ear measurements while making programming changes to the hearing instrument on the same screen. When you run the REM Speech ™ from within NOAH, the client records are stored in the NOAH database.

Preparation

You need to load your own copy of NOAH to the REM Speech ™, since you are the licensed user of that software.

INSTALLING THE REM SPEECH™ MODULE IN NOAH

The REM Speech™ module must be installed in NOAH.

Follow these instructions to install the module.

- From the desktop, open *NOAH*.

- Go to *Tools / Setup / Install Module*.

- Click *Install New Module.*

Insert the MedRx REM Speech™ software CD into your computer.

- Click the *Browse* icon.

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

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

- Click *OK.*

CONFIGURE THE NOAH TOOLBAR

To assign the REM icon on the toolbar to the MedRx REM Speech™, perform the following:

- Go to *Tools / Module Buttons*.

- Click the down arrow icon under the Real Ear Measurement Button heading and select MedRx REM Speech™.
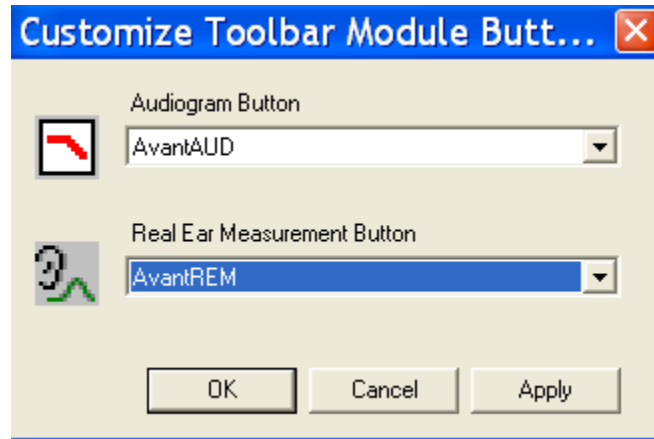
- Click *OK*.

This assigns the real ear measurement icon on the NOAH toolbar to the REM Speech ™.

EXERCISE

"REAL TIME" REAL EAR MEASUREMENTS (REM) WHILE SIMULTANEOUSLY PROGRAMMING HEARING INSTRUMENTS.

Preparation

- For the purposes of the following exercise, <u>create a new patient </u>record in NOAH.

- <u>Manually enter an Audiogram</u>

Enter the following audiogram values for the right and left ear:

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

UCL values:
100 at 250
100 at 500
95 at 1000
95 at 2000
90 at 3000,4000,6000 and 8000Hz.

- Save the record.

The New Audiogram appears under the Session summary with a date and time stamp.

- Setup

Pre-program the hearing instrument using the patient's audiometric data as appropriate. Make sure the instruments are connected to the HIPRO cables.

Click *Fitting icon* on the NOAH toolbar.

Select the manufacturer's fitting module and pre-program the hearing instrument.

Save the initial programming in the fitting module.

Click the *real ear measurement* icon on the toolbar.

The REM Speech ™ main menu screen appears.

- Perform an otoscopic inspection of the patient's ear canal.

- Insert the probe tube into the patient's right ear canal. Use the VO to assist in placing the probe tube.

- With the probe microphone still in the ear canal, insert the patient's hearing aid. Take care not to advance the probe microphone tube further into the ear when you insert the hearing aid.

- Position the patient facing the box loudspeaker at a distance of no more than 3 feet.

- Click the *NOAH LSM* icon on the REM Speech ™ main menu screen.
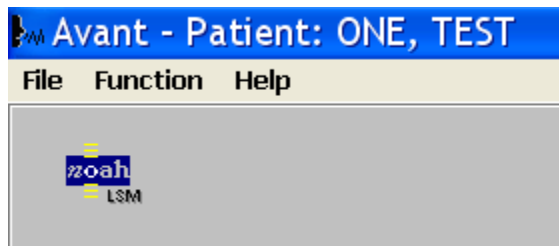
The LSM screen appears on the display as a small window. This window remains on top of the NOAH screens and can be moved and resized. The client's audiogram data has automatically been imported to the LSM screen.
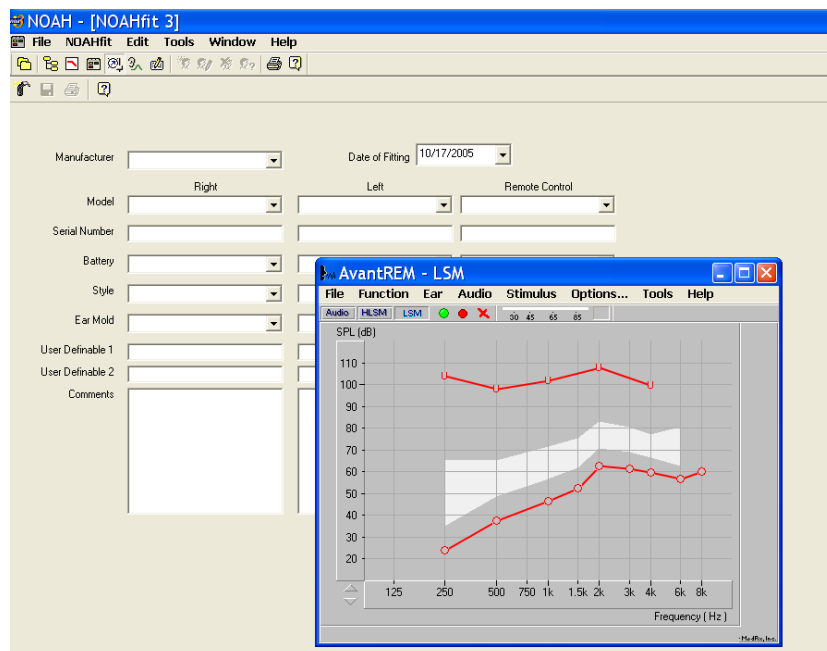
You are now ready to make programming changes to the hearing instrument from the fitting software, while simultaneously monitoring the outcome on the REM LSM display.

NOTE: The "active" window is identified by a bright blue toolbar. An "inactive" window is identified by a pale blue toolbar. To make changes in either the fitting or LSM screen, make sure the window you are clicking in has a bright blue toolbar. To make a window "active", simply click anywhere on that window.

- Turn LSM ON

Click the green circle icon on the toolbar or press Enter on the keyboard to activate Live Speech Mapping. A real-time Live Speech Map is displayed on the screen.

To stop LSM, click the red circle icon on the tool bar or press Esc on the keyboard.

See the Lesson on Live Speech Mapping for exercises to be completed for Hearing Instrument Fitting Verification.

Other signal input types for LSM:

In addition to using Live Speech to measure aided performance, other input stimuli options are available in LSM.

On the LSM toolbar, click **Stimulus; MIC; Music File; CD Player; Pink Noise (PN); Speech Noise(SN) or White Noise(WN).**

The REM Speech ™ produces SN, PN and WN from the speakers. The input level is monitored by the VU meter. Adjust the speaker output by changing the dB level on the software or the speaker volume control.

SAVING THE FITTING AND LSM DATA

When you are satisfied with the hearing instrument fitting, you need to save the fitting settings and the LSM curves.

SAVE AND CLOSE THE NOAH FITTING MODULE FIRST.

- When the fitting module is closed, click the *real ear measurement* icon on the NOAH toolbar.

This opens the REM Speech ™ LSM screen to full size.

- To save the NOAH session, click *Back*.
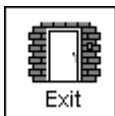
- Click *Exit*.

The NOAH Sessions summary now lists a Fitting record and MedRx REM record.

VIEWING SAVED SESSIONS IN THE NOAH DATABASE

To view the REM LSM data, double click on the MedRx REM session from the Sessions list in NOAH.

- Click *LSM*.

The stored curves are automatically displayed on the LSM screen.

LESSON TWO

LIVE SPEECH MAPPING

In almost all cases, the primary reason for fitting a hearing aid is to improve speech understanding. It stands to reason that we must then use **speech** to evaluate and verify a hearing aid fitting.

Live Speech Mapping is the most useful demonstration of how much "normal" or "soft" speech is inaudible to the unaided ear. When a hearing instrument is fitted and programmed correctly, the Live Speech Map will remain within the boundaries of the patient's dynamic range of hearing for soft, comfort and loud input levels. This demonstrates the advanced technology in the hearing instrument as it is self adjusting to provide the correct amount of amplification for the listening environment, without the need for the patient to continually adjust a volume control.

What is our target?

Consider the patient's residual dynamic range as the target area for soft, comfortable and loud input levels. Soft speech should be audible for as many frequencies as possible. Remember, for some severe high frequency losses, audibility does not always contribute to improved speech understanding. Always evaluate aided speech understanding with appropriate post fitting materials. Comfort level speech should fall in the lower half of the dynamic range and Loud speech should never exceed the UCL values.

What is the modified speech spectrum?   The long term speech spectrum for normal voice in quiet, modified to represent the most comfortable listening level for normal speech levels in quiet for the patient's reduced dynamic range of hearing :   loudness normalization. When using the speech spectrum, aim to have the peaks of the measurement for comfort speech reach the top of the spectrum for as many frequencies as possible.

EXERCISES

LSM has multiple applications. The following exercises step you through the most common applications of LSM.

Please complete the previous lesson on using LSM within NOAH before attempting the exercises in this lesson.

EXERCISE ONE: DEMONSTRATE THE HEARING LOSS TO THE PATIENT AND THIRD PARTY USING LIVE SPEECH MAPPING IN THE UNAIDED EAR

Preparation for Exercise One.

- Open *NOAH* from the desktop.

- Open a client's folder.   (select the client used in the NOAH lesson or start a new client and enter the audio values below:)

- Click the *real ear measurement module* icon on the toolbar. The REM Speech™ main menu appears on your screen.

- Click *LSM* on the main menu screen.

The first screen is AUDIO. The program automatically retrieves the patient's audiogram values in the patient's current record.

If you created a new patient for this lesson: enter the following audio values:

- *Right Ear, AC*:

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

- Click *UCL* and enter the following values:

100 at 250, 100 at 500, 95 at 1000, 95 at 2000, 90 at 3000, 90 at 4000,6000 and 8000Hz.

- Click *Help* to read a description of the AUDIO screen Follow the links for speech spectrum and speech sounds overlay.

Close the help file using the *X* icon.

EXERCISE ONE: DEMONSTRATE THE HEARING LOSS TO THE PATIENT AND THIRD PARTY USING LIVE SPEECH MAPPING

- Explain the Audiogram to the patient and third party.

Include an explanation of the speech spectrum, the normal dynamic range of hearing and the patient's reduced dynamic range due to the hearing loss and the reduced tolerance levels (UCLs).

HL
Speech
Mapping
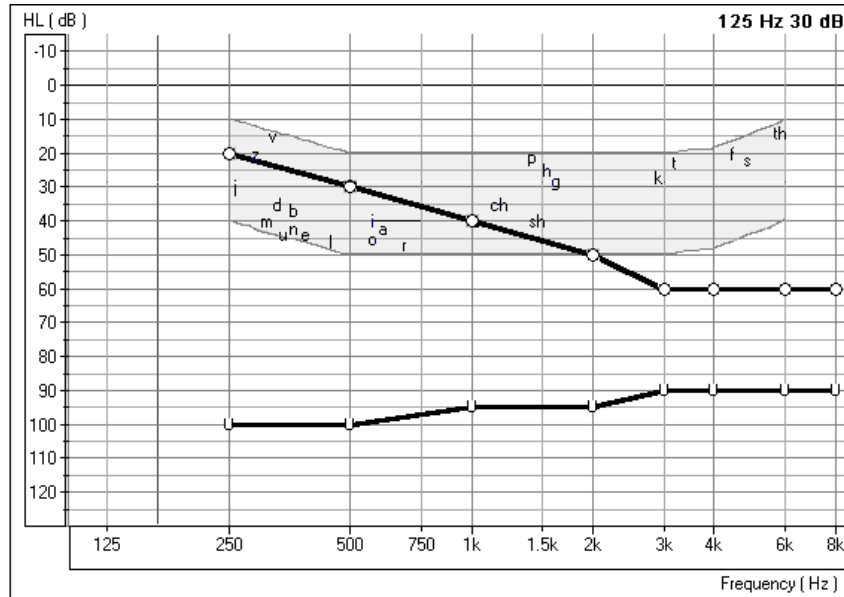
- Click the *HL Speech Mapping* icon on the taskbar.

The Hearing Loss (HL) Speech Mapping screen displays the Live Speech Map in dB HL. This allows the clinician to compare Live Speech input to the patient's audiogram values and long term speech spectrum on a familiar audiogram format. The peak values of the speech map must go below the patient's audiogram values before they are audible. The speech spectrum is a useful guide for demonstrating the frequency range of the different sounds in speech.

Review the audiogram graphic with the patient and third party again, this time adding the Live Speech Map function. Explain that unless sounds reach below the hearing threshold levels, they are not audible.

- Perform an otoscopic inspection of the patient's ear canal. Use the Video Otoscope preview mode by clicking on the *camera* icon on the toolbar.

- Insert the probe tube into the patient's right ear canal. Use the VO to determine correct probe tube placement.

Back

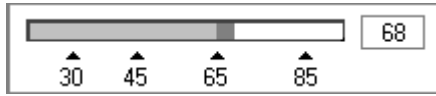- Click *Back* to return to the HL Speech Mapping screen.

Position the patient facing you at a distance of 3 feet. Make sure the patient and third party can also see the monitor.

- Click *Start* or press Enter on the keyboard.

Start

Speak in a normal conversational level. Monitor the input level with the VU meter on the display.

Monitor the dynamic Live Speech Map on the display and point out where your voice is audible and inaudible. In the following example, the low frequencies are audible (ie. Live speech map is louder than thresholds) however, the mid to high frequencies are not audible (ie. Live Speech Map does not reach threshold levels).
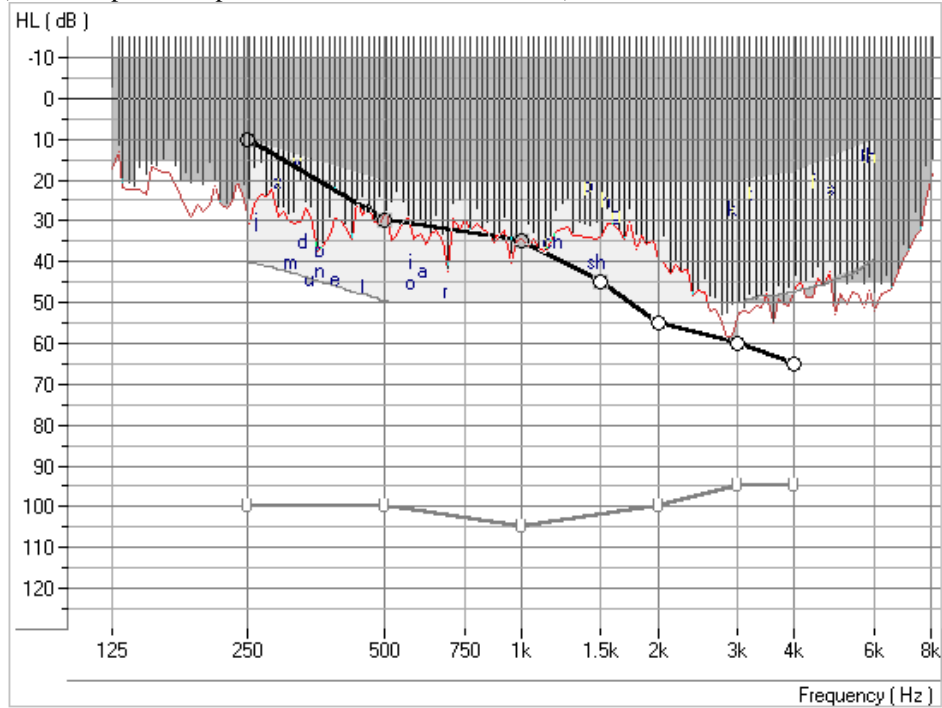
HL Speech Map

This is also a good time to demonstrate "pitch". Using a low and a high frequency tuning fork, you can further explain the distribution of pitch.

• Position the third party facing the patient at a distance of 3 feet and have the third party speak in a normal conversational level. Monitor the Live Speech Map and point out where important speech sounds are being missed.

• Click *Stop* or Esc on the keyboard.

The peak energy of the Live Speech Map recorded since you pressed Start is stored to the screen.
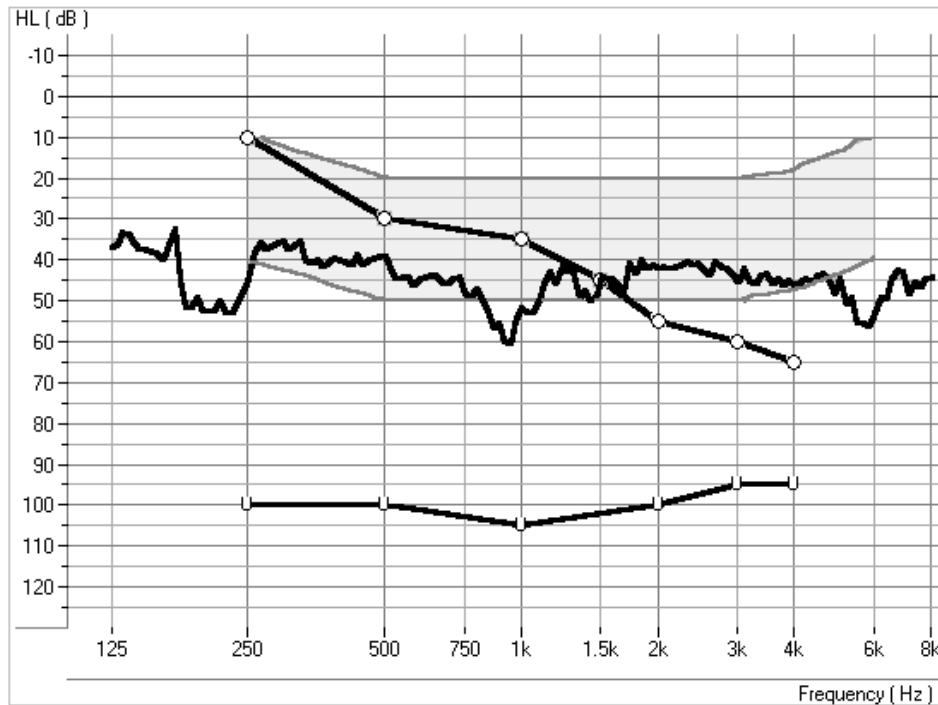
Stored LSM curve in HL Speech Mapping.

To Discard unwanted stored curves

Point and click the mouse to the stored Live Speech curve. The curve will momentarily change to a white line. Click *Discard*. The curve is removed from the display.

USING THE RAINBOW PASSAGE

It is useful to present material which is representative of long term speech for Live Speech Mapping. The Rainbow Passage provides all of American English speech sounds as they would occur in everyday speech.

A printed laminated panel with the Rainbow Passage is provided with the REM Speech™. It is also available in online Help and in the back of this manual.

Position the patient facing you at a distance of 3 feet.

Make sure the testing room is quiet.

• Click *Start*.

Read the Rainbow Passage in your normal speaking voice. As soon as you have completed the Rainbow Passage, immediately click the *Stop* icon.

Look at the stored Live Speech Map curve on the display and provide feedback to the patient.

You can repeat this exercise with the third party speaking the Rainbow Passage.
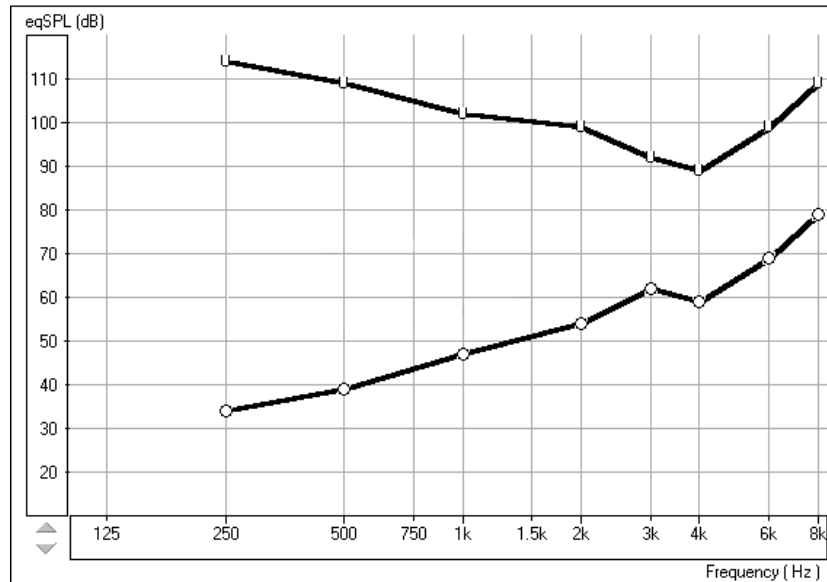
Unaided live speech mapping in DB*SPL*

- Click *Live Speech Mapping* on the taskbar.

- Click *Help* and become familiar with the display and icons used in Live Speech Mapping.   Read the link to Live Speech Mapping.

Close the help file using the *X* icon.

LSM display

Explain the display to the patient and third party. The display still shows the patient's hearing loss and tolerance levels, however this time the graph represents soft sounds at the bottom and very loud sounds at the top. Until sounds reach the hearing threshold levels, the patient cannot hear the sounds. When the sounds go higher than the U symbols, they become intolerable.

- Perform an otoscopic inspection of the patient's ear canal. Use the Video Otoscope preview mode by clicking on the *camera* icon on the toolbar.

- Insert the probe tube into the patient's right ear canal. Use the VO to determine correct probe tube placement.
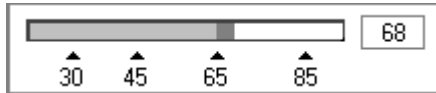
- Click *Back* to return to the REAR screen.

- Click, *Right Ear*.

Position the patient facing you at a distance of 3 feet. Make sure the patient and third party can also see the monitor.

Start

- Click *Start* or press Enter on the keyboard.

Speak in a normal conversational level. Monitor the input level with the VU meter on the display.

Monitor the dynamic Live Speech Map on the display and point out where your voice falls below threshold.

This is also a good time to demonstrate "pitch". Using a low and a high frequency tuning fork, you can further explain the distribution of pitch.

Position the third party facing the patient at a distance of 3 feet and have the third party speak in a normal conversational level. Monitor the Live Speech Map and point out where important speech sounds are being missed.
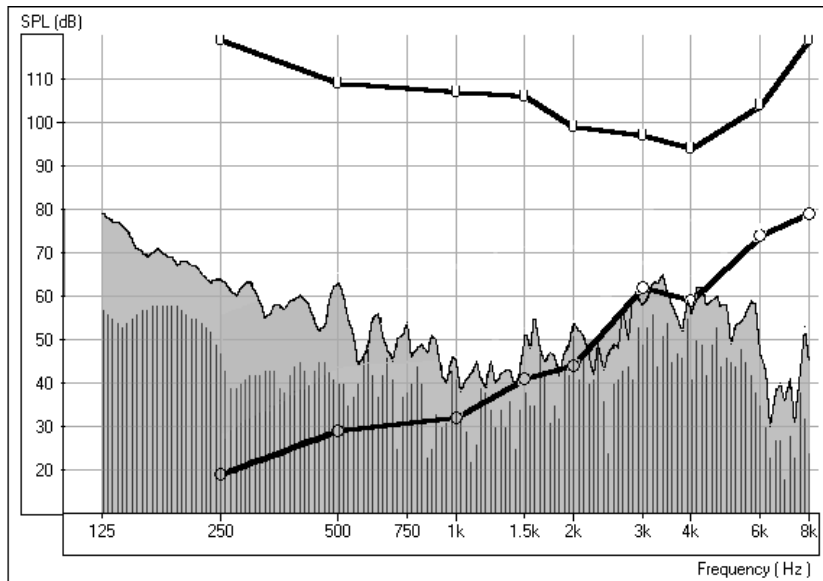
Live Speech Map for unaided normal speech

Stop

- Click *Stop* or Esc on the keyboard.

The peak energy of the Live Speech Map recorded since you pressed Start is stored to the screen.

Discard

- Point and click the mouse to the stored Live Speech curve. The curve will momentarily change to a white line. Click *Discard*. The curve is removed from the display.

USING THE RAINBOW PASSAGE

It is useful to present material which is representative of long term speech for Live Speech Mapping. The Rainbow Passage provides all of American English speech sounds as they would occur in everyday speech.

A printed laminated panel with the Rainbow Passage is provided with the REM Speech™. You will also find it in the Help files and at the end of this training guide.

Position the patient facing you at a distance of 3 feet.

Make sure the testing room is quiet.

Click *Start*.

Read the Rainbow Passage in your normal speaking voice. As soon as you have completed the Rainbow Passage, immediately click the *Stop* icon.

Look at the stored Live Speech Map curve on the display and provide feedback to the patient. You are aiming to have the curve between the lower one third and one half of the dynamic range.

You can repeat this exercise with the third party speaking the Rainbow Passage.

These curves provide a good comparison to any aided Live Speech curve measured in the same manner.

EXERCISE TWO: VERIFY HEARING INSTRUMENT FITTINGS USING LIVE SPEECH MAPPING

The main objective of hearing instrument fittings is to make as much speech information available to the patient as possible. The verification procedure used when fitting hearing instruments MUST include real ear measurements using Live Speech.

NB: If you are proceeding from exercise one, remain in the Live Speech Mapping task. Otherwise follow the next step.

- Click *LSM* on the main menu screen.

The first screen is AUDIO.

- Enter the audio as for exercise one.

Review the Audiogram with the patient and third party. Include an explanation of the speech spectrum, the normal dynamic range of hearing and the patient's reduced dynamic range due to the hearing loss and the reduced tolerance levels (UCLs).

- Click *Live Speech Mapping* on the taskbar.

Explain the display with the patient and third party. You will have performed an unaided demonstration at the hearing test appointment, so this is not the first time they have seen this screen.

If you did not perform an unaided demonstration of Live Speech Mapping at the first appointment, spend some time explaining this screen. The display still shows the patient's hearing loss and tolerance levels. The graph represents soft sounds at the bottom and very loud sounds at the top. Until sounds reach the hearing threshold levels, the patient cannot hear the sounds. When the sounds go higher that the U symbols, they become intolerable.

- Make sure you have pre-programmed the new hearing instrument prior to this appointment. (see Lesson Two)

Place the patient's new hearing instrument in the test ear. Take care not to advance the probe microphone tube further into the ear when you insert the hearing aid.

Position the patient facing you at a distance of 3 feet.

- Click *Start* or press Enter on the keyboard.

Begin speaking to the patient at a normal conversational level (65-70dB). You can present the Rainbow passage, or read from any other magazine article.

Adjust the programming as necessary for the peaks of comfort level speech to be at the top of the aided speech spectrum.

Note: The hearing instrument can be programmed from the fitting module in NOAH or from manufacturer specific stand alone programs installed on your REM Speech™. The exercises in Lesson Two teach you how to program within NOAH. To use a stand alone fitting program, minimize the REM Speech™ program and open the manufacturer's fitting software from the desktop. Program the aid and return to the LSM screen using **Alt** + **Tab** keys on the keyboard. Press and hold the Alt key down and press once on the Tab key to toggle between the opened programs.

Many hearing instruments have at least two independent channels in which to adjust gain and an adjustable cross over frequency to set the width of these channels.

Make adjustments to these parameters until comfort level speech measurements are between the lower third and half of the dynamic range.
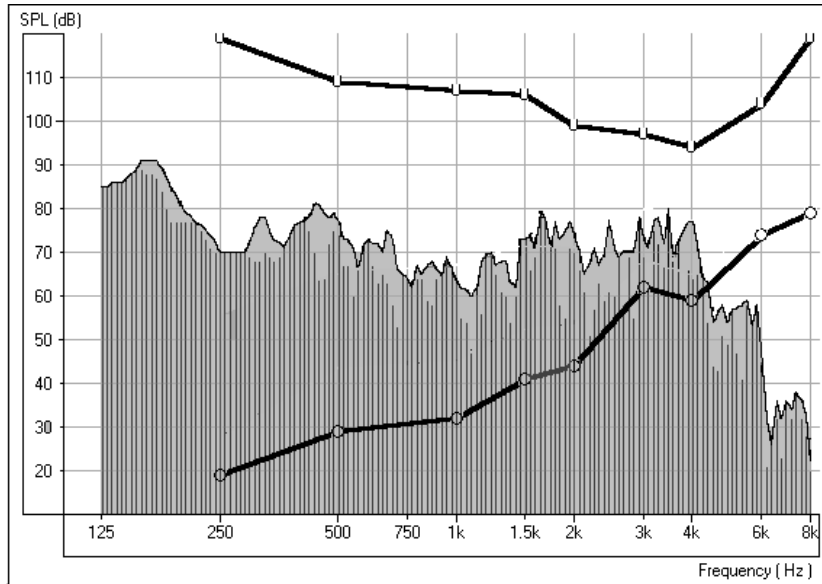
Normal conversational speech Live Speech Map

Continue with the Live Speech Mapping by demonstrating the instrument's performance for **soft** and **loud** speech. <u>Aim</u> to have as much of the soft speech audible for as many frequencies as possible. You may need to adjust the kneepoint(s) to allow sufficient gain for soft inputs. Make sure the UCL tolerance limits are never exceeded for a loud input. Make adjustments to the compression ratios or limiting to ensure the UCL's are never exceeded for loud inputs.
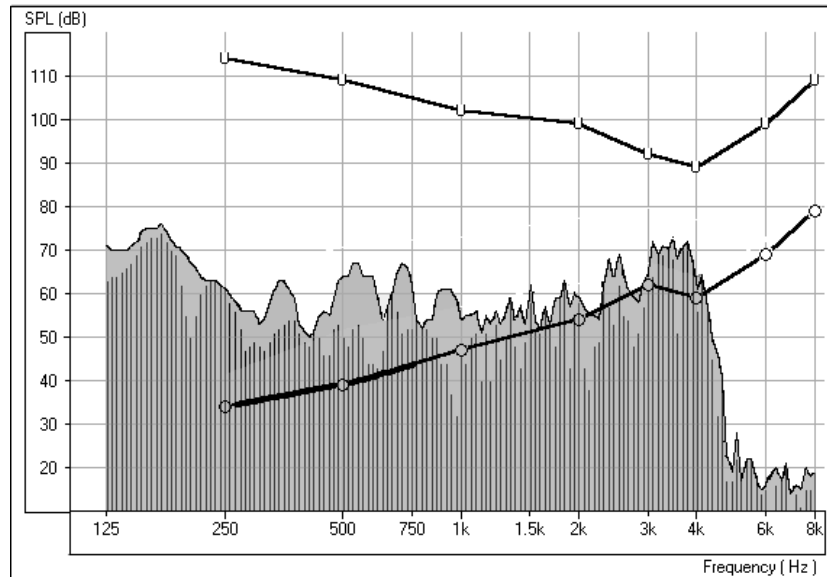
Good soft speech Live Speech Map
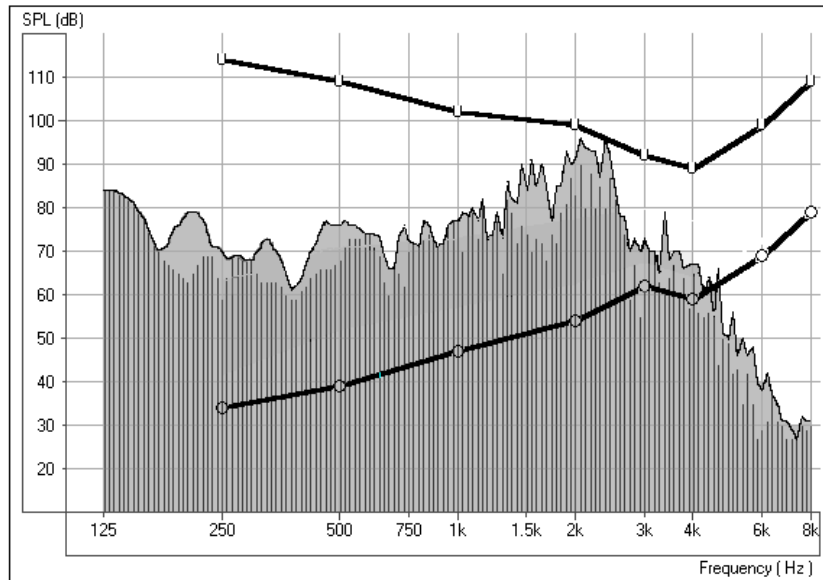
Good Loud speech Live Speech Map

If you have programmed the instrument correctly, the Live Speech Map will remain within the boundaries of the patient's dynamic range of hearing for soft, comfort and loud input levels.

EXERCISE THREE: MANAGING FEEDBACK USING LSM

Live Speech Mapping can be used to monitor for feedback. It is possible to "see" feedback before it is audible to you.

Live Speech Mapping is also used to demonstrate directional microphone effects, compression features, volume control adjustments, ear mold modifications and multiple memories.

FEEDBACK

One of the biggest challenges faced in hearing instrument fittings is "feedback". Live Speech Mapping is a unique and effective approach to dealing with feedback.

When a hearing instrument is in "feedback", it adds distortion and is a source of annoyance to the wearer and others who can hear it. When you are performing Live Speech Mapping, you can monitor the curve on the screen for the presence of feedback. It is possible to "see" feedback before it is audible to you.

What does feedback "look" like?

Look for a "spike" in the Live Speech curve in the high frequencies.

You may see one big spike in the response, in addition to other smaller spikes at higher frequencies than the big spike. The big spike represents the fundamental frequency of the feedback and the smaller spikes are harmonics of this fundamental.

The following diagram illustrates feedback with a fundamental peak frequency at 2200Hz.
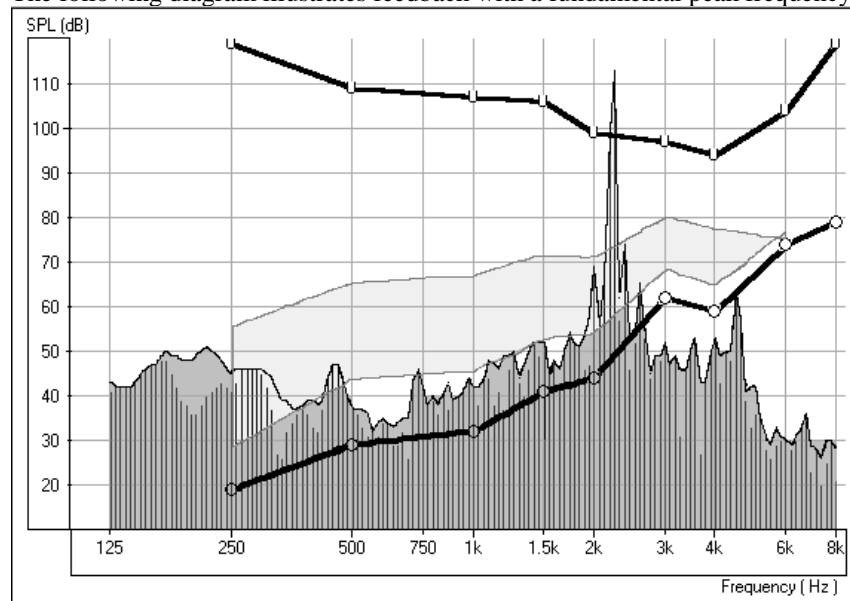
Feedback at 2200Hz

How to eliminate feedback?

Firstly, check that the hearing instrument is properly inserted in the patient's ear.

Make sure the overall volume of the hearing instrument is set to the patient's preferred listening level for normal conversation.

Adjust the gain for the fundamental frequency of the feedback. This is where the spike is biggest.

Make sure these adjustments to the hearing instrument have been effective in eliminating the feedback by repeating the Live Speech Mapping curve.

When feedback is removed, repeat the Live Speech verification procedure to be sure you still have adequate gain for comfort and soft speech.

LESSON THREE

Occlusion Effect

One of the biggest concerns we have in hearing instrument fittings is dealing with the common complaints of: " I sound like I am in a barrel"; "I don't like the sound of my own voice"; "My own voice seems too loud";   " I feel blocked up".

Our knee-jerk reaction upon hearing these complaints is to quickly grab the offending hearing instrument, run to the back room and start modifying the aid by grinding on it, or by decreasing low frequency gain. Sometimes this works. Why doesn't it work all the time?

In order to treat these complaints effectively, it is necessary to have a good understanding of the cause of the complaint. Is the cause due to the Occlusion Effect? Or is the complaint due to an incorrect frequency response in the aid?

What is Occlusion Effect?

 The definition of Occlusion Effect is the build up of self-generated energy (patient's own voice) in the ear canal, due to the coupling of the hearing aid to the patient's ear.

Basically, by plugging up the ear canal with a hearing instrument, we trap some of the low frequency energy created when the patient speaks.   This low frequency energy is transmitted through the skull to the external ear. When the ear canal is not blocked, this energy escapes down the ear canal and is not heard.

EXERCISES

EXERCISE ONE: OCCLUSION EFFECT DEMONSTRATION

EXERCISE TWO: MEASURING THE OCCLUSION EFFECT

What is Occlusion Effect?

The Occlusion Effect is a specialized, yet easy to perform test, to *objectively* assess clients who report discomfort with their own voice. Some clients report they seem like they are "speaking in a barrel" or "feel blocked up". These are signs of a build up of low frequency energy in the ear canal. However, occlusion effect may not be the cause in all cases.

The amount of trapped low frequency energy in the ear canal can be measured objectively in the Occlusion Effect function in the Live Speech Mapping (LSM) menu.

To measure the Occlusion Effect, we use the patient's own voice as the stimulus and the real ear probe microphone positioned at the eardrum. The patient vocalizes "eeeeee" without the hearing aid in the ear, performing the Open Ear Spectrum measure. This measure is then compared to the same vocalized input with the hearing aid in the ear, but turned off. The resulting difference is the Occlusion Effect.

EXERCISE ONE: OCCLUSION EFFECT DEMONSTRATION

With both hands cupping each side of your chin, along your jawbone, rest your elbows on a hard surface.

Say the sound "Shhhhhh".

Now say the sound "Eeeeeeeeee".

Which of these two sounds do you "feel" as vibration on your hands?

The "eeeeee" sound will generate more vibration.

This time, place the tip of your index finger in each ear canal to close the canal. Make the same sounds "Shhhh" and "Eeeee".

Which is louder?

The "eeeee" sound will be louder.

You have just experienced the Occlusion Effect.

EXERCISE TWO: MEASURING THE OCCLUSION EFFECT

- Click *LSM* on the main menu screen for the REM Speech™.

- Click *O/E* on the taskbar.

About the display: The grid on the left of the display has a dB SPL vertical axis and a Frequency in Hertz horizontal axis. The only icons on the control panel are for test ear.

- Click *Right Ear*.

The first step is to perform an <u>Open Ear Spectrum</u> measurement, which will act as a baseline for this patient's normal voice level in the ear canal.

- Click the *camera* icon and <u>perform</u> an otoscopic exam of the ear canal.

- Click *Back* to return to the Occlusion Effect screen.

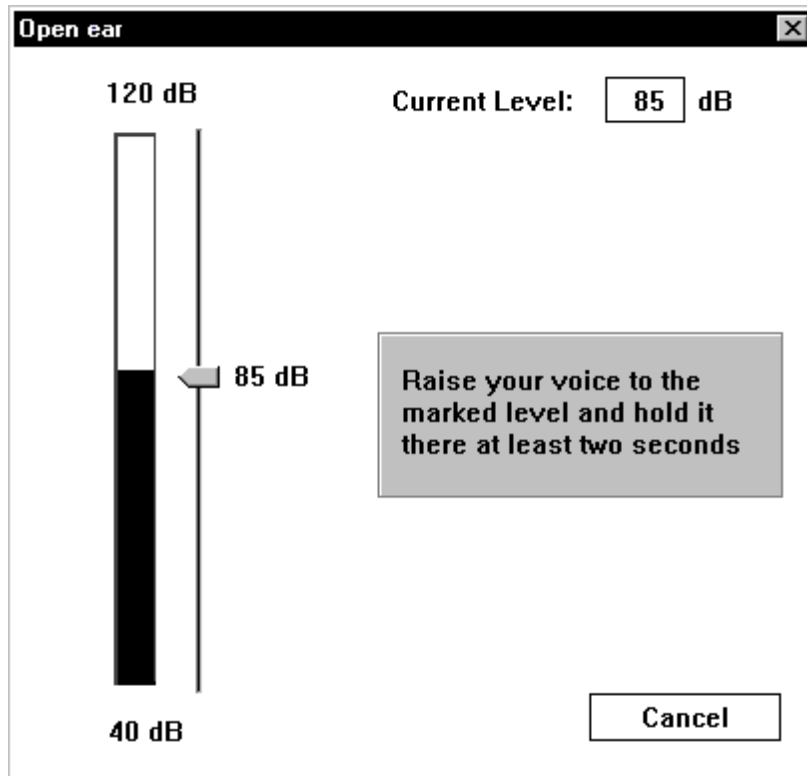<u>Insert</u> the probe microphone to within 6mm of the eardrum.

- Click *START*.

A vertical VU meter appears on the screen.

<u>Instruct</u> the client to make the sound "eeeeee" and hold this sound constant at the target level indicated by the arrow. The default level is 85dB. When the appropriate level is reached and sustained for two seconds, the system stores the measure to the screen automatically.

Open ear

120 dB

Current Level: 85   dB

85 dB

Raise your voice to the
marked level and hold it
there at least two seconds

40 dB

Cancel

When the Open Ear measurement is stored, you will see a colored line at zero dB on the display to indicate the program has "normalized" the client's Open Ear Spectrum for comparison to the next "occluded" measurement.
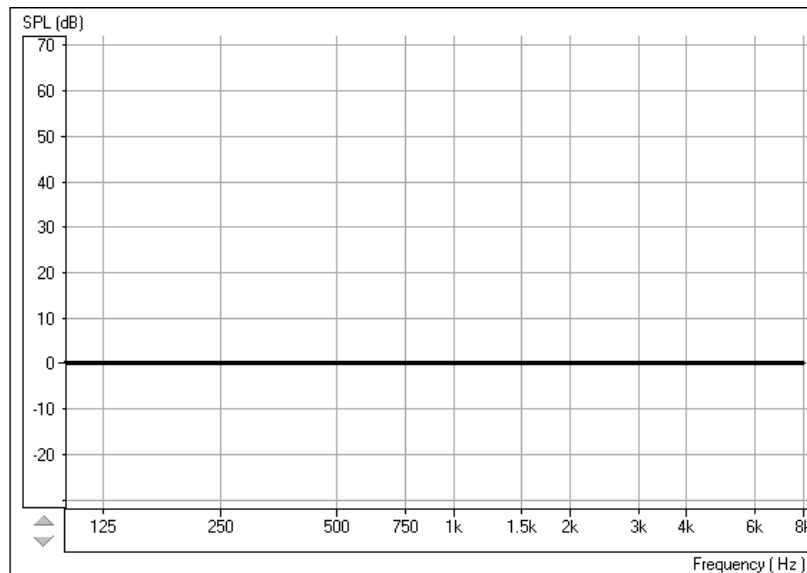
Tip: If the patient has difficulty holding their voice level to 85dB, click the *Arrow* icon on the Volume Level meter and drag up or down to the desired level. This is only required for patients with very soft or loud voices.

OCCLUDED EAR MEASUREMENT.

Insert the patient's hearing aid, making sure you do not advance the probe tube further down the ear canal. The hearing instrument is turned OFF and the battery door is closed.

- Click *Start*.

A text box message appears and requests you to confirm you are performing the Occluded Ear measurement or allowing you to repeat the Open Ear Spectrum measure. Only repeat the open ear measure if you are dissatisfied with the first Open Ear Spectrum measurement.

The program defaults to selecting the Occlusion Effect option.
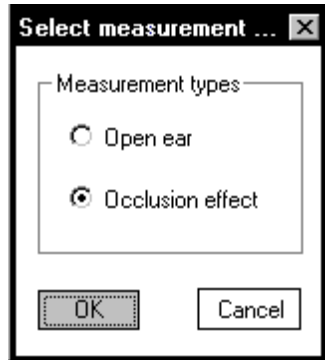
- Click *OK*.

The Volume Level meter appears on the screen to show the "target" voice level for the patient to reach when saying "eeeeee".

Instruct the patient to say "eeeeeee" while you point to this "target" level until the measurement is captured.

The Occlusion Effect curve is plotted to the screen automatically after the patient has sustained an "eeeeeeeee" at the target level for one second.
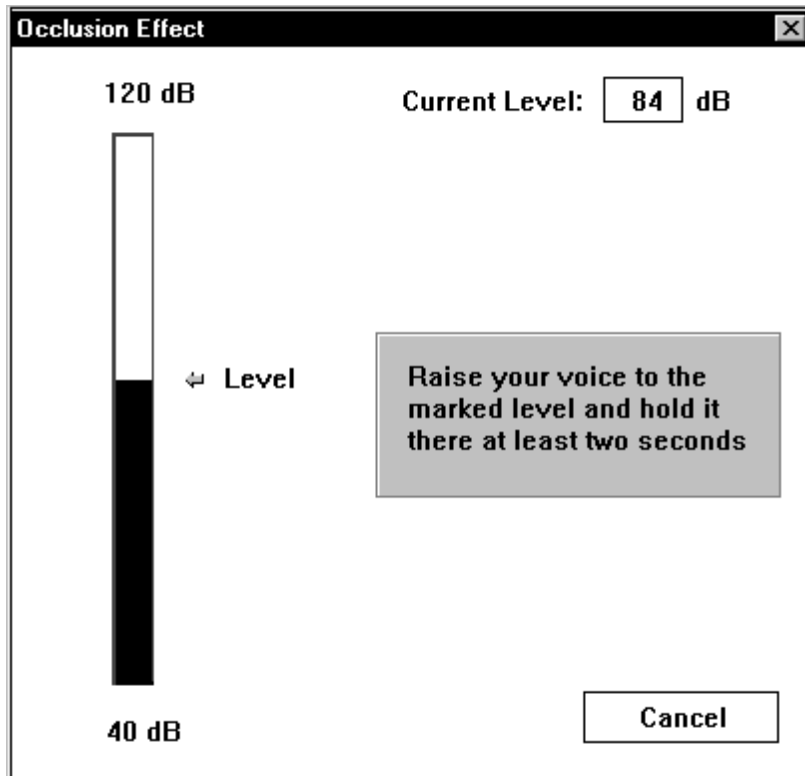
Target Level for Occluded measurement

Note: You can customize the "smoothness" of the occluded ear response curve by going to **Options / Live Speech / Smooth O/E**. The default smoothing is 7 points.

Interpreting the results

Usually, a measure of 20 dB SPL or more in the low frequencies is noticeable occlusion effect to the client and indicates a need to modify the hearing instrument fitting to reduce this effect. Subsequent measures of the Occlusion Effect can reveal if such modifications have been effective in reducing the amount of occlusion.
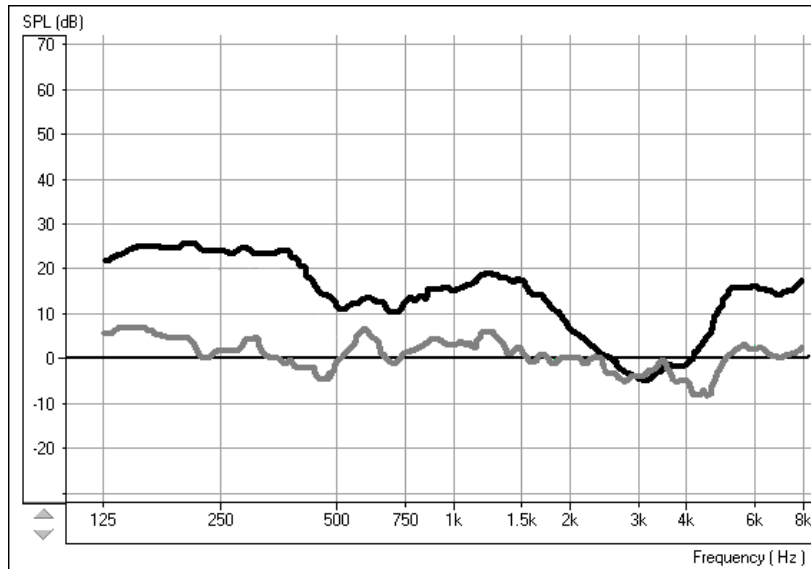
The top curve indicates significant occlusion effect. The lower curve is a close match to the normalized zero line and does not indicate significant occlusion effect.

Suggested modifications to the hearing instrument include:

Increasing the insertion depth
Tapering the canal tip of a CIC
Maximizing the venting, while considering the risk of feedback.

A key to good customer service is to **always** be prepared to take a new, deep impression.

If you are unable to reduce the amount of occlusion effect by making physical changes to the hearing instrument, consider increasing the low frequency gain of the instrument. This additional low frequency gain may "mask" the amount of trapped energy in the ear canal, making it less noticeable to the patient when they speak.

What can you do if you do not measure any significant occlusion effect?

No amount of modifications to the shell or acoustic coupling of the hearing instrument to the patient's ear canal will change the patient's complaints about their own voice if you do not measure any occlusion effect.

The cause of the patient's complaints is more likely to be an inappropriate frequency response or other acoustic amplification characteristic of the hearing instrument.

Return to the *LSM* and make adjustments to the frequency response while monitoring the patient's subjective response in regard to the pleasantness of their own voice. Monitor the patient's own voice using Live Speech Mapping.

LESSON FOUR

REAL EAR MEASUREMENTS (REM)

Do not be overwhelmed by the number of tasks offered under the REM menu. We strongly advocate the use of Live Speech Mapping for verifying hearing instruments fittings.

The ANSI standard for real ear measurement tasks describes the tests included in our menu. For a definition of each standard measurement, please refer to the online Help menu.

INTRODUCTION TO REAL EAR MEASUREMENTS

Background

WHAT ARE REAL EAR MEASUREMENTS (REM)?

Real ear measurements are measurements of sound obtained with a probe tube microphone placed at the eardrum of the patient, therefore taking into account the specific external ear resonance characteristics.

A common approach for real ear measurements, until recent years, included steps to calculate a prescription based on hearing threshold levels, using known fitting rules to generate target insertion response curves. These target curves are a guide for the optimum adjustment of the hearing instrument amplification at the eardrum.

The current most popular approach to real ear measurements looks more closely at the actual sound pressure level (SPL) at the eardrum. The target for aided measurements is the *patient's own dynamic range of hearing*, determined by their hearing thresholds and UCLs.

WHAT IS THE REAL EAR AIDED RESPONSE (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 hearing instrument inserted in the ear and turned on.

Live Speech Mapping provides a unique opportunity for the patient to experience and understand the benefits of quality hearing instruments. "Seeing" the benefits of high end hearing instruments is important in the auditory rehabilitation process for the patient.

Live Speech Mapping in Real Ear Measurements (REM) provides a dynamic presentation of how much "speech" is reaching the patient's eardrum. When measured in the unaided ear canal, LSM is used to counsel the patient and third party on the effect of the hearing loss on understanding speech. (shows how much speech is not audible) A better understanding of the hearing loss usually makes it easier for the patient and third party to accept and commit

to rehabilitative help. Live Speech Mapping is also a fast and accurate approach to successfully program hearing instruments for fitting and troubleshooting.

How it works: Speech input measured by the probe microphone is analyzed by the system and displayed in "real time" as a continuously updating peak curve from 125Hz to 8kHz. The measurement can be directly compared to the patient's Audiogram values (in dB HL or dB SPL display), the modified aided speech spectrum, MCL and UCL values on the display. The live speech input level is monitored in real time with a **referenceVU** meter on the display. Louder or softer input levels are obtained either by varying distance between the speaker and the reference microphone or by adjusting the percentage output level of the external speaker accordingly.

During testing, a peak curve representing the maximum dBSPL reached at each discrete frequency over the duration of the live speech input appears on the screen. In addition, the actual dB level at each octave band is displayed as a bar at each octave and a text box displays the peak decibel level numerically at each octave or half octave frequency. This detailed information is useful in programming the gain and compression of the hearing instruments for soft, moderate and loud input levels.

Assumption

It is assumed you have a basic Audiological knowledge sufficient to carry out hearing instrument fittings and are familiar with the concepts of hearing instrument fitting supported by real ear insertion gain measurements.

In addition to diligently carrying out Real Ear Measurements to provide a means of adjusting, comparing and verifying hearing instrument settings at the patient's eardrum, you are encouraged to obtain other qualitative judgments and speech discrimination scores, judge the patient's reactions, and use your clinical experience when fitting hearing instruments.

REAL EAR MEASUREMENT MENU

Audio
Fitting Rx
Real Ear Unaided Response (REUR)
Real Ear Unaided Gain (REUG)
Real Ear Insertion Gain (REIG)
Real Ear Aided Response (REAR)
Real Ear Aided Gain (REAG)
Real Ear Occluded Response (REOR)
Real Ear Occluded Gain (REOG)
Real Ear to Coupler Difference (RECD)

Each Real Ear task is defined and described in online Help. To perform any of these tasks, please follow the directions provided in the Help menu, accessed from the Help icon on any screen.

In addition to Live Speech Mapping to verify hearing instrument fittings, some clinicians like to use the ICRA stimuli in REAR. The following exercise provides some guidelines for using ICRA sounds in aided testing for real ear measurements.

EXERCISE ONE: USING ICRA-NOISE TO VERIFY NON-LINEAR HEARING INSTRUMENT FITTINGS

ICRA-Noise is a new stimulus designed for testing non-linear hearing instruments.

One method for using the ICRA-Noise stimulus options is outlined below.

- Click *ICRA* on the control panel.

- Click the *down arrow* icon beside the ICRA icon.

- From the drop down track options, select Track 4, 1 Female 3-band single speaker. This is a measure of response of the aid for a female voice at comfort level.

- Set the level to the patient's MCL.

With the probe microphone still in the ear canal, insert the patient's hearing aid in their ear. Take care not to advance the probe microphone tube further into the ear when you insert the hearing aid.

[NOTE: the probe tube microphone must be recalibrated every time the tube is replaced or changed in length. Probe Tube Calibration can be accessed from the *Calibration* menu on the main screen or from *Tools/Calibrate Probe Tube* menu in Real Ear]

Position the patient facing the box loudspeaker at a distance of no more than 3 feet.

- Click *Start* or press Enter on the keyboard.

The stimulus level will be adjusted automatically before the ICRA noise is initiated. The sampling time recommended is 20 - 30 seconds. The sampling time is either pre-determined in the program or can be set under **Options │ Options │ Average Time (sec)**.

The REAR curve stored to the screen is an FFT analysis of the output measured at the probe microphone for the duration of the stimulus.

Aim to have the peaks of the curve in the middle of the dynamic range.

- Repeat this procedure using Track 5, 1 Male 3-band single speaker.

Again, aim to have the REAR measurement peaks midway between threshold and UCL.
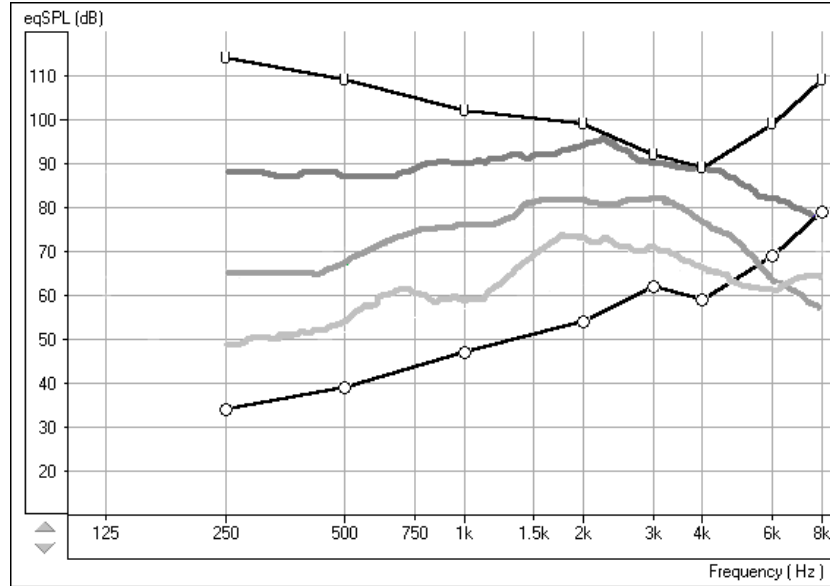
Test at Loud Level

- Click the *down arrow* icon next to the ICRA icon.

- Select Track 9, 1 female + 1 male and 2 female + 2 male, loud voice spectra.

Do not adjust the attenuator Test level. Keep the test level at the patient's MCL.

- Click *Start* or press Enter.

The REAR curve stored to the screen should not exceed the patient's UCL at any frequency.

REAR   **Stimulus type :**

LESSON FIVE

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 REM Speech™ use the tympanometer, start the REM Speech™ 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.

HOW TO PERFORM 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 REM Speech TM (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.
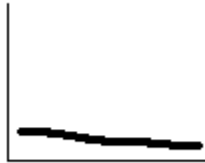
High volume Type B

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 (< -100daPA). 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 REM Speech™ 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 REM Speech™ screens for the presence or absence of an AR at 500, 1000, 2000 and 4000Hz at 95dBHL.

HOW TO PERFORM 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 REM Speech™ (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 REM Speech™ displays the AR data as the size of the reflex (in cc) for each frequency tested.

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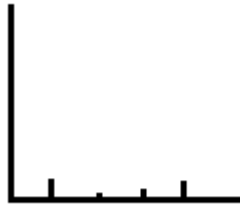
The absence or presence of very small reflexes. This outcome is consistent with either middle ear disorders, high reflex thresholds or lack of integrity of the neural arc for acoustic reflexes.

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 REM Speech™. The new data will overwrite the old data.

LESSON SIX

HEARING LOSS SIMULATOR(HLS) AND MASTER HEARING AID(MHA)

Hearing Loss Simulator (HLS)

The **H**earing **L**oss **S**imulator "simulates" the effect of the client's hearing loss for the spouse or family member. The program attenuates an input signal to simulate the audiogram. It is a powerful counseling tool for the spouse or family member, who can listen to how their own voice is distorted by the hearing loss.

EXERCISES

EXERCISE ONE: USE THE HLS TO *SIMULATE* THE DIFFERENCE BETWEEN NORMAL HEARING (NORMAL) AND THE PATIENT'S HEARING LOSS (SIMULATED)

EXERCISE TWO: *SIMULATE* THE POTENTIAL IMPROVEMENT IN THE PATIENT'S HEARING PERFORMANCE WHEN HEARING INSTRUMENTS ARE WORN

EXERCISE THREE: USE THE HEARING LOSS SIMULATOR TO *SIMULATE* THE NATURAL DETERIORATION IN THRESHOLDS OVER TIME

Operating the REM Speech ™ from NOAH

- Open *NOAH* from the desktop.

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

- Click the real ear measurement module icon on the toolbar.

The REM Speech TM main menu appears on your screen.

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

EXERCISE ONE: SIMULATE THE DIFFERENCE BETWEEN NORMAL HEARING (NORMAL) AND THE PATIENT'S HEARING LOSS (SIMULATED)

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.

!!!!!Note: Any time you make changes to audiogram data in a screen with the title AUDIO, you are making permanent changes to the record. The only screen where you can make changes to the audiogram data and NOT effect the data stored in the opened record is in the Hearing Loss Simulator (HLS) screen.
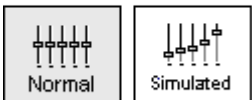
- Click the *HLS* tab on the taskbar.

- 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.
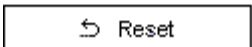
- Select *Track 2* on the CD control panel.

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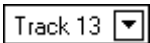
Allow the third party to listen to the music for 20 - 30seconds, reinforcing that this is how the third party normally hears this music.

- Click *Simulated*. Tell the third party that they are now listening to the patient's hearing loss.
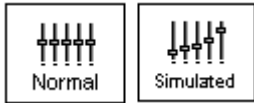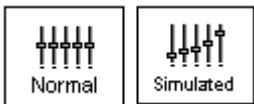
- Alternate between *Normal* and *Simulated* so that the third party can appreciate the difference.
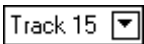
- Repeat the simulation with Track 13, which is a female voice in quiet.

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.

- 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.
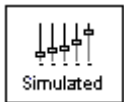
When they have identified the sound, press *stop* and replay track 15 in the normal mode. Click *Normal* and then *Play*.
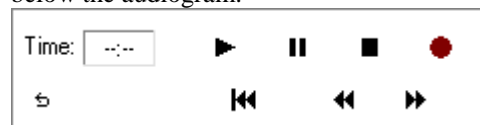
This is an effective demonstration of how the patient may not be hearing important environmental sounds for safety.
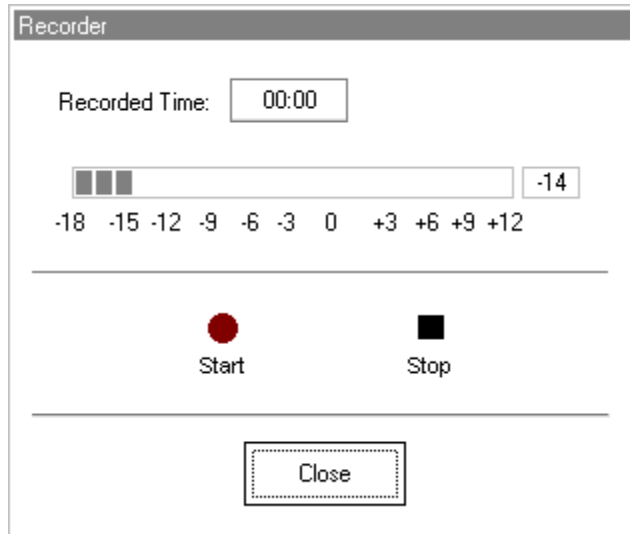
HOW TO USE THE RECORD INPUT OPTION:

- 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 REM Speech™.

• 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.

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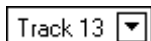
- Click *Simulated*. Select *Track 13* on the File control panel. (Make sure *File* is selected as the input signal)

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.
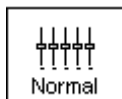
- At this point, click the *Normal* icon. Explain to the third party that while you can dramatically improve the hearing performance with hearing instruments, it is still not normal hearing.
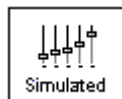
- With the track still playing, click *Simulated* again. Remind the third party that with the hearing aid, the patient hears better than without the hearing aid. To demonstrate this, click the *Reset* icon on the control panel. This resets the audiogram to the patient's original hearing loss values.
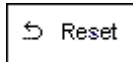
You can repeat this simulation with a variety of tracks on File.

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.

EXERCISE THREE: USE THE HEARING LOSS SIMULATOR TO SIMULATE THE NATURAL DETERIORATION IN THRESHOLDS OVER TIME

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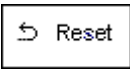
- To return to the original audiogram, click the *Reset* icon.

Master Hearing Aid

It is highly recommended you use demonstration hearing aids, as master hearing aids, to introduce patients to hearing instrument technology. Providing the patient with the experience of listening to a "real" hearing instrument is a superior demonstration to a master hearing aid "simulation". However, the Master Hearing Aid provided in the REM Speech TM is a quick way to <u>simulate</u> 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.

<u>Setup for Master Hearing Aid</u>

- 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.

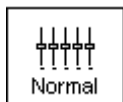Enter the same values for the Left Ear.

- 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 <u>before</u> 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.

RECORD YOUR OWN STIMULUS:
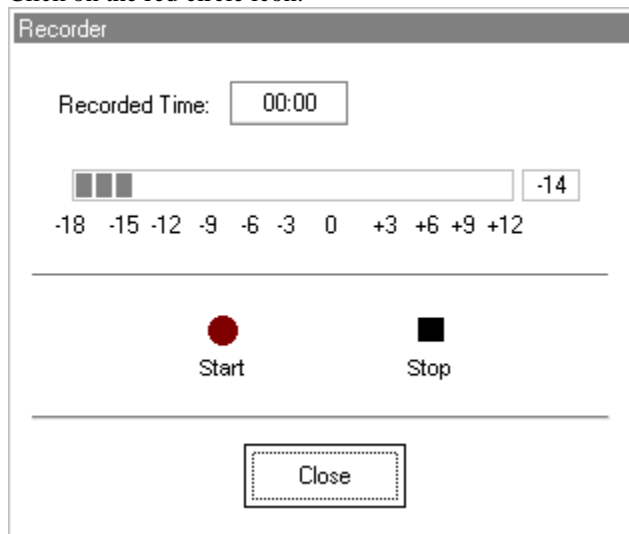
- Select *Record* on the MHA control panel.   A new control panel appears on the display below the audiogram.

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 REM Speech™.

- 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.
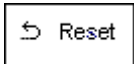
Sound is too "tinny"?: If the patient reports that the signal is too "tinny", you can reduce the high frequency gain or increase the low frequency gain by editing the gain plot on the display. To do this, select the ear icon to be adjusted and simply point to the preferred level of gain on the gain curve 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 REM Speech™ 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.

LESSON SEVEN

VIDEO OTOSCOPY

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

Click *Scope* icon.

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.

Left Ear	▼
Left Ear	
Right Ear	
Portrait	
Left Hearing Aid	
Right Hearing Aid	
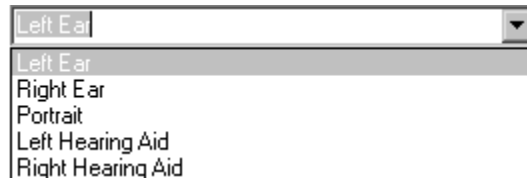
Click *Capture* to store the image.

Capture as many images as you like by returning 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.

USE THE KEYBOARD TO CAPTURE IMAGES

Use the <u>single click capture</u> mode to capture the images.

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

Click *Capture*.   All the screen icons are now inactive.

Hit <u>any</u> 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 <u>right</u> mouse button anywhere on the screen.

☑ Sequence   To capture a <u>sequence</u> 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.
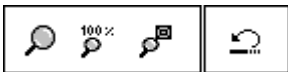
Back

View and enhance stored images

Open a stored image and use the enhancement tools

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

Click the image to be viewed in the Description column.

Click *Open*.

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 <u>right</u> click the mouse button. Select *Rename* and type the new label for the image.

EXIT THE IMAGE TASK

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

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.

LIMITED WARRANTY

MedRx, Inc. warrants the MedRx AVANT REM Speech System 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. 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

MedRx will repair or replace any defective parts, fully test and calibrate the system and/or components and ship the system promptly back to the owner. There is no cost for this warranty service, 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 degrees 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 components at the purchaser's request, charging for parts and labor as necessary.