

**AURICAL** Plus

# **AURICAL Plus with DSL<sup>®</sup> v. 5.0b**

## **Quick Guide**

**CE**  
0459

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**otometrics**  
MADSEN • AURICAL • ICS

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## **Version release date**

1. September 2011

## **Technical support**

Please contact your supplier.

## **IMPORTANT!**

For comprehensive information regarding safety, see the AURICAL Plus User's Reference Manual. It contains information and warnings, which must be followed to ensure the safe performance of AURICAL Plus. Local government rules and regulations, if applicable, should also be followed at all times.

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# AURICAL Plus with DSL<sup>®</sup> v. 5.0b

## Quick Guide

<b>1 Quick Guide for AURICAL Plus REM with DSL<sup>®</sup> v 5.0b</b>	<b>5</b>
1.1 Intended use	5
1.2 Setting up for DSL <sup>®</sup> v 5.0b	5
1.2.1 In Situ SPL graph Always On Left	19
1.2.2 Settings outside the DSL Setup dialog	21
1.3 Measuring RECD with AURICAL Plus REM	22
1.3.1 Prerequisites	22
1.3.2 Coupler measurement	24
1.3.3 Real Ear Measurement	26
1.3.4 Collecting RECD for both ears	28
1.3.5 Reusing the coupler measurement	29
1.4 Troubleshooting RECD	30
1.4.1 High frequency roll-off	30
1.4.2 Signal leak	31
<b>Index</b>	<b>33</b>



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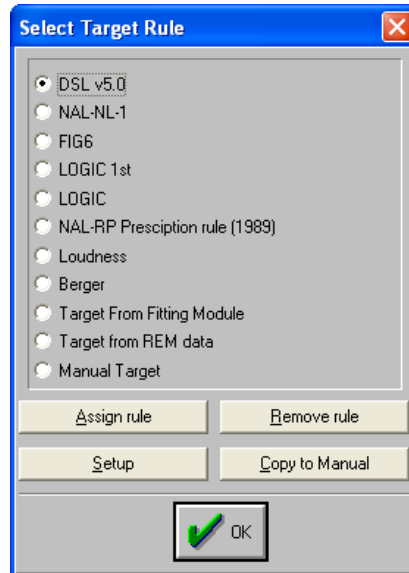
# 1 Quick Guide for AURICAL Plus REM with DSL<sup>®</sup> v 5.0b

## 1.1 Intended use

The DSL v 5.0b algorithm allows for fine-tuned fitting for three populations: infants, children, and adults. It takes into consideration the type of audiometric measurement (including corrections for ABR/ASSR measurements), type of fitting (binaural versus monaural), and type of hearing loss (including corrections for mixed and conductive hearing loss). Enhanced normative data for RECD with eartip or earmold coupling that are better suited to hearing aid fitting in infancy are implemented. Additionally, the algorithm is improved for achieving more comfortable adult targets and targets for different listening environments.

## 1.2 Setting up for DSL<sup>®</sup> v 5.0b

1. To select the DSL target rule, click on **Setup > Select Rule**, and the following dialog box appears:



When you select DSL 5.0b as the target rule, the **Setup** button is enabled.

**Note** - *When you review previous fitting sessions, make sure that you re-select the appropriate target rule and the corresponding setup parameters. This ensures that the target curve will be displayed correctly.*

2. Click on **Setup** and the **DSL v5.0b Setup** dialog box appears (if DSL has already been selected, this box appears automatically when the REM module is opened):

DSL v5.0 Setup

Age:  
 Above 18 years  
 Child

Birth Date: 01-01-1999 Today: 19-04-2010

Transducer: ABR Mold HI Type: BTE HI Cgmpr. Type: WDRC

Binaural Fitting  Use measured UCL  Use Bone Conduction

>> Advanced Settings OK Cancel

**Note** • *The box labeled Birth Date:*

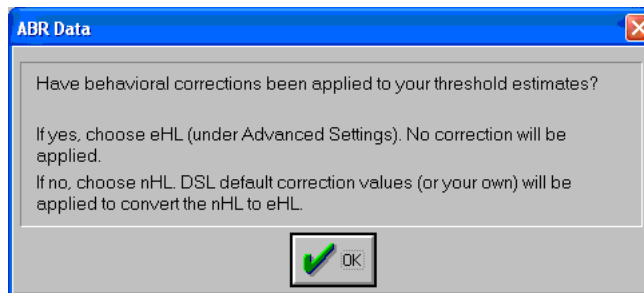
- *Under NOAH:*  
If the birth data has been entered in advance in NOAH's Client Module, this box will automatically be filled in.
- *Stand-alone*  
If you are operating Aurical Plus outside NOAH, type in the correct birth date. Use the date format displayed in the box at right.

The DSL setup is divided into the following main sections:

- selection of transducer
- selection of hearing instrument type
- selection of hearing instrument compression type
- miscellaneous settings
- **Advanced Settings** tab

<b>Settings</b>	
<b>Transducer</b>	<p><b>Selection of transducer</b></p> <p>The selected transducer is used in conversion of HL to SPL values to compensate for the fact that the transducers are calibrated with couplers simulating average adult ear, whereas the DSL algorithm takes into account individual variability in ear canal size and shape.</p> <p>The different transducers available are listed, each in a drop-down menu (v5.0b) for selection.</p> <p>Make sure that you select the same type of transducer that was used for obtaining thresholds.</p> <p>SF stands for Sound Field.</p> <p><b>Note</b> - <i>The ABR transducer types have been added to the v 5.0b setup.</i></p> <p>If you select either <b>ABR Tip</b> or <b>ABR Mold</b>, a warning is shown regarding the handling of ABR data in <b>Advanced Settings</b>. The DSL algorithm does not support TDH headphones as an ABR transducer type, and accordingly is not an option.</p>





Settings	
<b>HI Type</b>	<p><b>Selection of HI Type</b></p> <p>Selection of hearing instrument type in this dialog box overrides any previous selection made in the <b>Hearing Instrument &amp; Coupler Selection</b> box. To ensure RECD values are applied correctly, make sure that the correct <b>HI Type</b> is selected.</p>
<b>HI Compr. Type</b>	<p><b>Selection of H.I. compression type</b></p> <p>For v 5.0b you can select either <b>Linear</b> or <b>WDRC</b> (default). The compression threshold selection has been removed from <b>Setup</b>.</p>

<b>Miscellaneous Settings</b>	
<b>Binaural Fitting</b>	If you enable this check box for fitting adults binaurally, there is a 3 dB reduction in the target gain when compared to a monaural fitting. The check box <b>Binaural fitting</b> in <b>Setup</b> is grayed out when the patient age is less than 18.
<b>Use Measured UCL</b>	If measured UCL data is available, the check box is enabled automatically. Missing UCL data points are interpolated. If no measured UCL data is available, the ABR transducer type is selected, or the <b>Use measured UCL</b> is deselected, and the internal DSL v5.0b algorithm is used to predict UCL data.
<b>Use Bone Conduction</b>	When this check box is enabled, DSL adjusts the targets for conductive hearing loss by increasing predicted UCL values by 25% of the air-bone gap. Targets are limited to a maximum of 140 dB SPL in the ear canal. No corrections for air-bone gap are applied for ABR data. The check box <b>Use Bone Conduction</b> in <b>Setup</b> is grayed out when the transducer type is <b>ABR Tip</b> or <b>ABR Mold</b> .

## Advanced Settings

Under the **Advanced Settings** tab you can adjust more of the detailed setting parameters.

The screenshot shows the 'DSL v5.0 Setup' dialog box with the following settings:

- Age:**  Above 18 years,  Child
- Birth Date:** 01-01-1999, **Today:** 22-10-2010
- Transducer:** ABR Mold, **HI Type:** BTE, **HI Cmpr. Type:** wDRC
- Binaural Fitting,  Use measured UCL,  Use Bone Conduction
- Buttons:** << Advanced Settings, OK, Cancel
- ABR Determined Thresholds:** Unit Type:  nHL,  eHL
- nHL to eHL Transform:**

250	500	750	1000	1500	2000	3000	4000	6000
30	20	17	15	12	10	7	5	5
- Used nHL to eHL Transform:** Default, **Used RECD:** Measured or Average, **Used REDD:** Average
- RECD Type:** HA1 Tip, **REUG Type:** SF 0°, **Verification Signal:** Pure Tone
- Venting Size:** None, **Client Type:** Pediatric, **Program Type:** Quiet
- Manual RECD:**

250	500	750	1000	1500	2000	3000	4000	6000
- Manual REDD:**

250	500	750	1000	1500	2000	3000	4000	6000
- Venting Correction:**

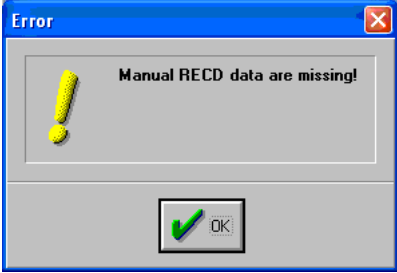
250	500	750	1000	1500	2000	3000	4000	6000

Advanced Settings	
<b>ABR Determined Thresholds</b>	<p>Allows the selection of <b>nHL</b> (normalized Hearing Level) versus <b>eHL</b> (estimated Hearing Level) as the unit type.</p> <ul style="list-style-type: none"> <li>• <b>nHL</b> refers to uncorrected ABR threshold data.</li> <li>• <b>eHL</b> assumes that correction factors have been applied to ABR data and that they reflect estimated behavioral hearing thresholds.</li> </ul>
<b>nHL to eHL Transform</b>	<p><b>nHL to eHL Transform</b> refers to the frequency-specific correction factor applied when <b>nHL</b> is the chosen unit type in order to convert to <b>eHL</b>.</p> <p>These values can be either default DSL values or values entered manually based on individual clinic norms.</p> <p>When Manual is the <b>Used nHL to eHL Transform</b> selection, the field for entry of the corrections factors is enabled.</p>

#### DSL Default Correction Values

<b>Frequency</b>	250	500	750	1000	1500	2000	3000	4000	6000
<b>nHL_to_eHL</b>	30	20	17	15	12	10	7	5	5

Advanced Settings	
	<p>For details about ABR stimulus and collection parameters which correspond with the DSL Default correction values please reference the following:</p> <p><i>Bagatto, M, Moodie, S, Scollie, S, Seewald, R, Moodie, S, Pumford, J, Liu, R, 2005. Clinical Protocols for Hearing Instrument Fitting in the Desired Sensation Level Method, Trends in Amplification, vol 9, 199-226.</i></p>
<b>Used RECD</b>	<p>Allows selection of measured, average, or manual entry of RECD values. <b>Average</b> refers to the age-specific RECD values predicted by DSL 5.0b.</p> <p>When a manual option is selected, the corresponding edit box below is enabled to allow manual entry of RECD data.</p> <ul style="list-style-type: none"> <li>• The recommended default selection is <b>Measured or Average</b>. If RECD has not yet been measured, the initial target will be based on the age-specific RECD values predicted by DSL 5.0b. The target will recalculate once the RECD is measured.</li> <li>• If <b>Always Manual</b> or <b>Measured or Manual</b> is selected and no values are entered the following error message will appear when <b>OK</b> is selected:</li> </ul>

Advanced Settings	
	 An error dialog box with a blue title bar and a red 'X' icon. The text inside reads 'Manual RECD data are missing!' next to a yellow exclamation mark. At the bottom is an 'OK' button with a green checkmark icon.
<b>Used RECD</b>	Allows selection of either between <b>Average</b> or <b>Manual RECD</b> . As with RECD, when <b>Manual</b> is selected, the corresponding RECD edit box is enabled.
<b>RECD Type</b>	<p><b>RECD Type</b> defines various RECD measurement conditions.</p> <p>To ensure that RECD values are applied correctly, make sure that the correct RECD Type is selected.</p> <ul style="list-style-type: none"><li>• <b>HA1</b> corresponds to ITE fittings.</li><li>• <b>HA2</b> corresponds to BTE fittings.</li></ul>

<b>Advanced Settings</b>	
	<p><b>Note</b> - <i>For assessment purposes the RECD is applied only when the transducers used to measure hearing are insert earphones.</i></p> <p>This is because RECD relates to a 2cc coupler and TDH headphones are related to a 6cc coupler. If any other transducer is used to measure hearing, there will be no impact/changes to the target curve as the measured RECD changes.</p> <ul style="list-style-type: none"> <li>• That is, for any transducer besides insert phones the only impact of the RECD measurement will be in the correct selection of the RECD Type and hearing instrument type.</li> </ul> <p>If those settings accurately reflect your fitting, they will be accurately reflected in the target and the application of RECD.</p>
<b>REUG Type</b>	Defines various REUG measurement conditions. The Default setting is 0 degrees azimuth.
<b>Verification Signal</b>	Allows selection of a verification signal.

### Advanced Settings

- Targets for **Pure Tone** signals are only available between 50 and 70 dB SPL.
- Targets for **Speech** are available between 45 and 80 dB SPL. If you select **Speech** as the verification signal, the Modulated ILTASS Weighted Noise will be used.

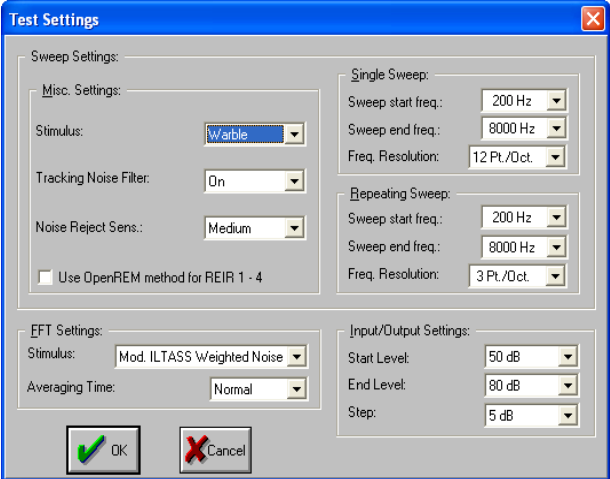
**Note** - *This selection does not set the stimulus for the actual measurement. It only indicates to the DSL algorithm the stimulus type used.*

To select stimulus type choose from the icons across the top of the main screen.

**Note** - *We recommend that you use modulated ILTASS weighted noise for soft and moderate inputs and the pure tone sweep for 90 dB curves, for either coupler or on-ear measurements.*

Test settings may be accessed under **Setup** in order to define the stimulus parameters.



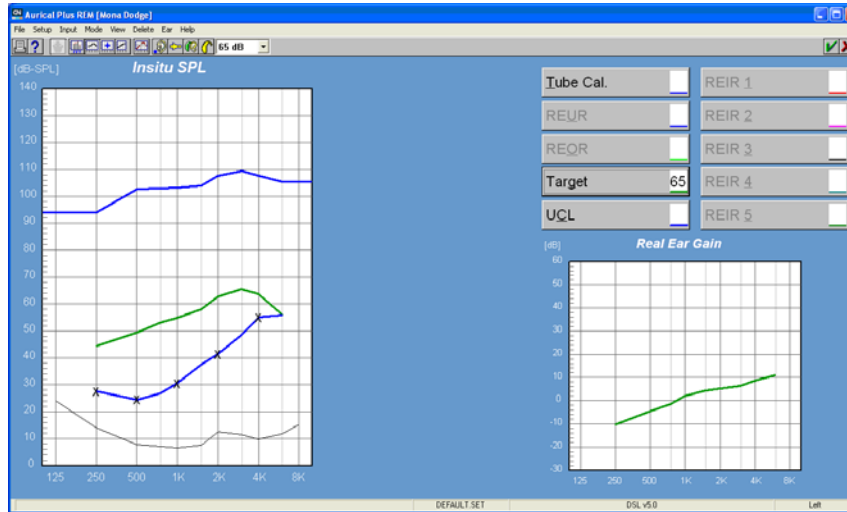
Advanced Settings	
	
<b>Venting Size</b>	<p>Defines the size of vent chosen for the fitting. Venting corrections are only applied in the 2-cc transform and will not affect the targets in real ear formats (REAR, REAG, REIG).</p>

<b>Advanced Settings</b>	
	<p><b>Note</b> - <i>Most hearing instrument manufacturers apply their own venting correction factors rather than the DSL predicted corrections. As such, it is difficult to accurately predict the effects of these corrections. None is the recommended venting size selection and is set as the default. This selection assumes an occluded ear coupling (meaning no venting corrections are applied to the target curve). When actual venting correction factors are known and Custom is selected, the corresponding edit box is enabled for entry of the venting correction information.</i></p>
<b>Client type</b>	<p>Defines whether the <b>Pediatric</b> or <b>Adult DSL m[i/o]</b> targets are generated. DSL v5 introduces lower level of prescribed gain and compression ratio for adults (i.e. presumably with acquired hearing loss) and higher pediatric targets (i.e. presumably with congenital hearing loss).</p> <p>The adult-child difference decreases with increasing hearing loss.</p> <p>Selecting <b>Pediatric</b> for an adult client will yield higher levels of prescribed gain.</p>

Advanced Settings	
<b>Program Type</b>	<p>Allows selection of <b>Quiet</b> versus <b>Noise</b> program type.</p> <p>This selection is used to derive targets for two listening environments. Clinicians may choose to change this setting if they are making measurements for quiet versus noise programs/memories on the same instrument.</p>

### 1.2.1 In Situ SPL graph Always On Left

The AURICAL Plus REM module is well-suited for using DSL because this procedure generates targets for output levels in the ear canal, in addition to gain targets. Therefore, when DSL is selected as the target rule, the screen automatically changes so that the In Situ SPL graph is the larger one on the left.



**Note** - When DSL v5.0b is used, the target curve shown in the Real Ear Gain graph will depend on the age of the client.

- For clients up to 12 months the displayed target will be a Real Ear Aided Gain (REAG) target.
- For clients older than 12 months the target will be a Real Ear Insertion Gain (REIG) target.

The measurement will take this into account.

## 1.2.2 Settings outside the DSL Setup dialog

Settings	
<b>Stimulus Intensity and Measuring Maximum output</b>	<p>Target curves are not available above 70 dB for Pure Tone and Speech Noise stimuli or 80 dB for speech stimuli. This means that in order to verify that the settings do not exceed the patient's UCLs, the UCL curve must be used as the guide. The response curve for a 90 dB pure-tone sweep stimulus should fall just below the UCL curve.</p> <p><b>Note</b> - <i>If 90 dB was the last stimulus level before exiting, the next session will not display targets until the stimulus level is lowered to 70 dB for non-speech stimuli and 80 dB for speech stimuli.</i></p>
<b>When using the FFT signals</b>	<p>For hearing aids with noise reduction, use the <b>Modulated ILTASS Weighted Noise</b> test signal.</p> <p>For other hearing aids, either the <b>Modulated ILTASS Weighted Noise</b>, <b>Modulated Speech Noise</b> or <b>Speech Noise</b> is acceptable.</p>

Settings	
	<p>If you do not have the Modulated Speech Noise or Modulated ILTASS Weighted Noise, you must either</p> <ul style="list-style-type: none"><li>• purchase it, or</li><li>• remember to disable noise reduction, then set the aids, then re-enable the noise reduction for every fitting in which this is an issue.</li></ul> <p>The FFT signal is unavailable as a stimulus option when <b>OpenREM</b> mode is selected.</p>

## 1.3 Measuring RECD with AURICAL Plus REM

### 1.3.1 Prerequisites

Before you start, you will need the tubing of the Madsen Electronics (ME) insert phone and the RECD coupling, the BTE coupler, the REM probe, and the patient (fitted with earmold or foam ear-tip).



1. Open the Aurical REM software.
2. Perform a probe tube calibration.
3. Click on **Mode**, then select **RECD**. A dialog box will display directions for performing the measurement. If it says **Step 1, Real Ear Measurement**, look below the directions and check the box that says **Do Coupler Step First**. This will switch the screen to read **Step 1, Coupler Measurement**.

### 1.3.2 Coupler measurement

*Follow the directions for the coupler measurement*

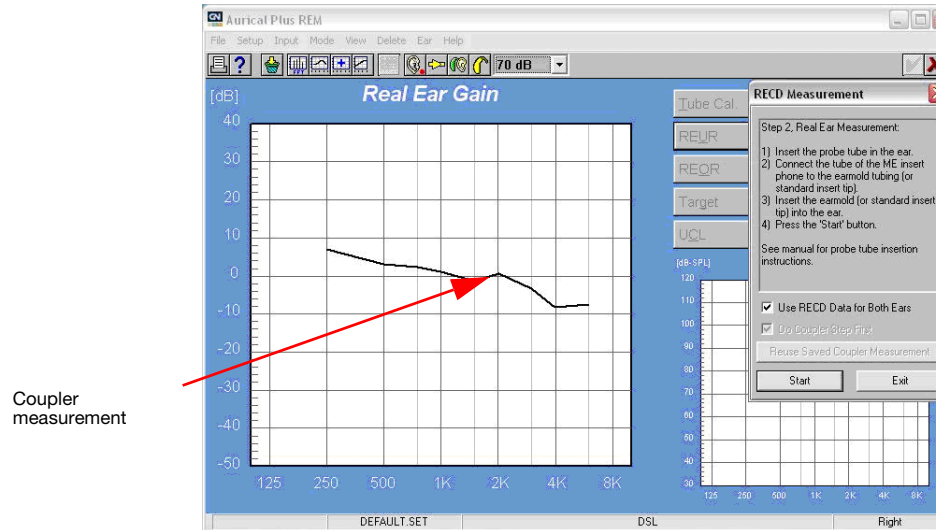
1. Connect the tube from the ME insert phone to the BTE coupler tube with RECD coupling.
  - Connect one end of the ME tubing to the metal piece on top of the probe housing.
  - Bring the probe housing over to the HIT box and connect the RECD coupling to the plastic tubing of the BTE coupler. See picture below.



2. Click on the **Start** button.



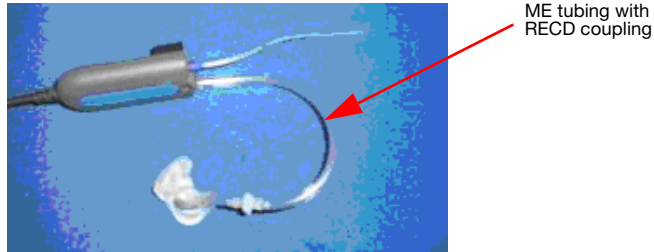
The dialog box will tell you when the measurement is completed. The coupler measurement will be displayed onscreen.



### 1.3.3 Real Ear Measurement

*Follow the directions for the real ear measurement:*

1. Insert the probe tube in the patient's ear.
  - Remove the RECD coupling from the tubing of the BTE coupler.
  - Hook the REM headset over the ears and insert the probe tube into the ear.  
For a baby, take the probe housing off of the headset and lay it on the baby's chest/shoulder or on his/her carry-all.
2. Connect the tube of the ME insert phone to the earmold tubing (or foam insert tip).
  - Insert the RECD coupling into the tubing of the custom earmold (or a foam insert eartip, if the earmold is not available). The other end of the ME tubing should still be connected to the metal piece on top of the probe housing.

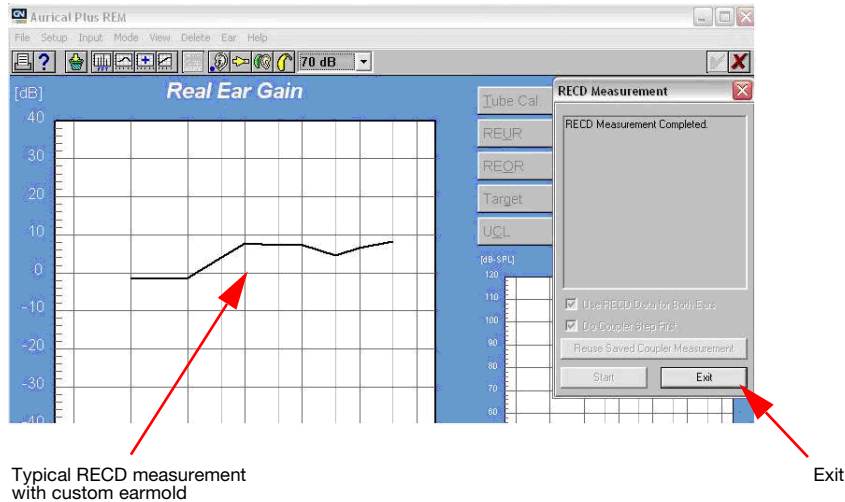


3. Insert the earmold (or foam insert tip) into the ear.

ME tubing with  
RECD coupling



4. Click on the **Start** button.
  - The graph will display the RECD measurement, which is the difference between the coupler response and the real ear response.
  - Click on **Exit** to return to the REM screen.

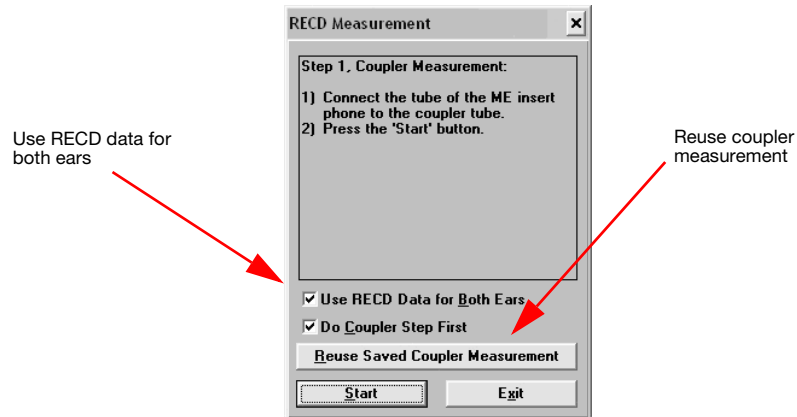


### 1.3.4 Collecting RECD for both ears

If **Use RECD Data for Both Ears** is checked, the RECD measurement for one ear will be applied to the fitting formula for both ears. This option is not recommended for patients that have vastly different ear canal shapes, surgical alterations of the ear, and/or abnormal middle ear status.

### 1.3.5 Reusing the coupler measurement

If the RECD measurement needs to be recollected because the patient moved or the curve is not accurate, exit the RECD screen and start over (click on **Mode**, then select **RECD**). In step **1. Insert the probe tube in the patient's ear.** ▶ 26, click on **Reuse Saved Coupler Measurement**. The previously stored coupler measurement will be displayed and the dialog box will switch to Step **2. Connect the tube of the ME insert phone to the earmold tubing (or foam insert tip).** ▶ 26.

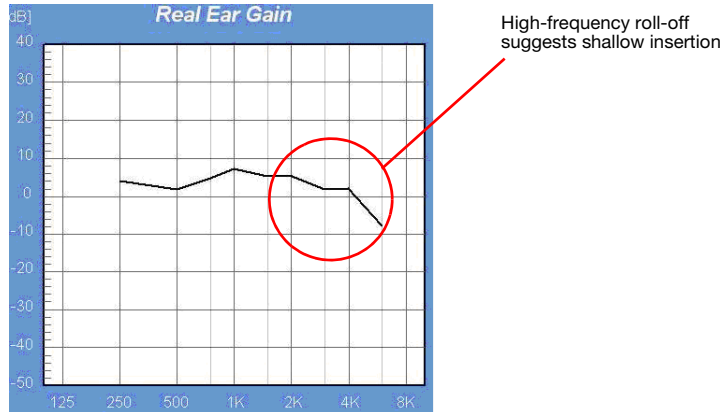


## 1.4 Troubleshooting RECD

### 1.4.1 High frequency roll-off

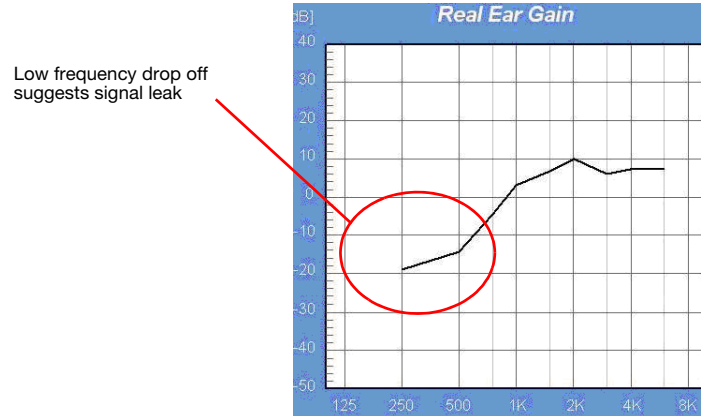
If the probe is too shallow, values at 3k, 4k, and 6 kHz will be lower than 2 kHz by 3 dB or more.

Reposition the probe tube.



### 1.4.2 Signal leak

If the signal is leaking out of the ear canal, values in the low frequency region (below 1000 Hz) will fall between -1 and -9 dB. Reposition a custom earmold or plug the vent. Reinsert a foam insert eartip until it is flush with the ear canal opening and/or use a larger foam eartip.







# Index

## A

Algorithm, DSL v 5.0a 5

## C

Correction values, nHL to eHL 12

Coupler measurement 24

Coupler measurement, reuse 29

## H

High frequency roll-off 30

## I

Intended use 5

## M

Measuring RECD 22

## N

nHL to eHL 12

## R

Real Ear Measurement 26

RECD 22

RECD, both ears 28

## S

Settings

ABR Determined Thresholds 12

Binaural Fitting 10

Client type 18

HI Compr. Type 9

HI Type 9

nHL to eHL Transform 12

Program type 19

RECD Type 14

REUG Type 15

Stimulus Intensity and Measuring Maximum  
output 21

transducers 8

Use Bone Conduction 10

Use Measured UCL 10

---

- Used RECD 13
- Used REDD 14
- Venting Size 17
- Verification Signal 15
- When using the FFT signals 21
- Setup
  - for DSL v 5.0a 5
- Signal leak 31

**T**

- Troubleshooting RECD 30