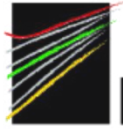




Western
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DSL[®]*m*[i/o]

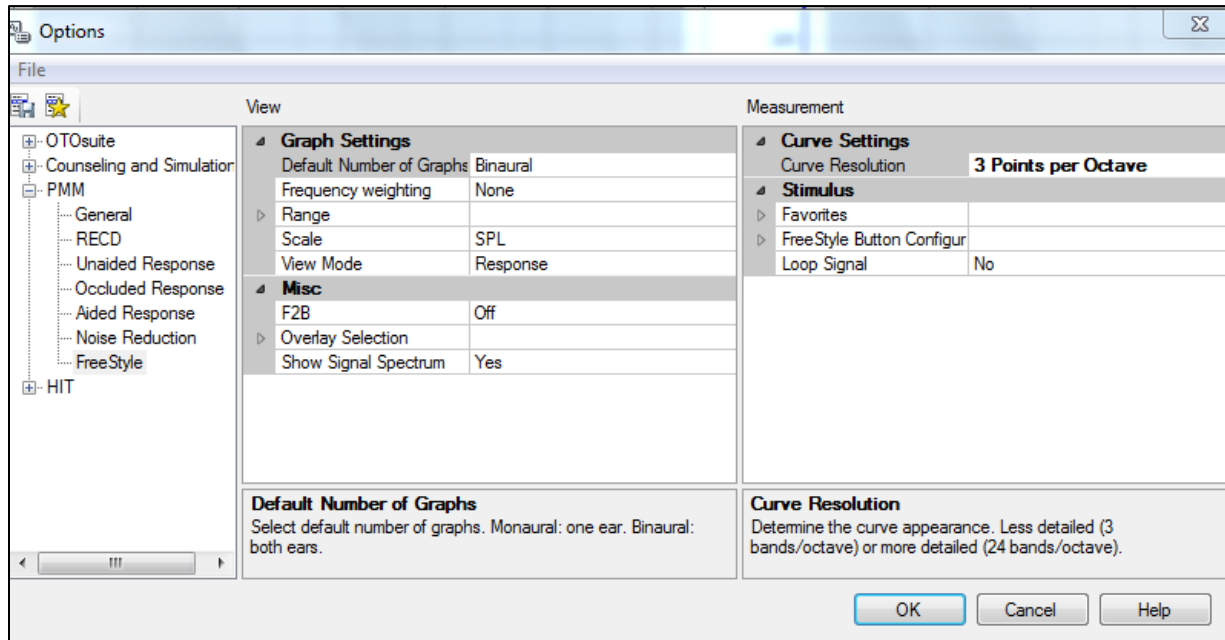
Using DSL[®] in the Aurical FreeFit[®] System: The Basics


1. Measuring the Real-Ear-to-Coupler Difference (RECD)
2. Setting a hearing aid to DSL prescriptive targets using the coupler approach to verification
3. Reference materials



Measuring the Real Ear to Coupler Difference (RECD)


Power up: Make sure the Aurical FreeFit® is turned on. Open Noah 4® and create a new client by choosing the <Add New Patient> icon  or choose an existing client under **Patient Browser**. Enter client details. Make sure measurement settings are in 3 points per octave.



Audiogram: Open the **Noah Aud** tab  at the top of the page to enter the client's audiogram. Enter the following audiogram for one ear, press the save icon at the top and exit.


| Frequency (Hz) | | | | | | | | |
|----------------|-----|-----|------|------|------|------|------|------|
| 250 | 500 | 750 | 1000 | 1500 | 2000 | 3000 | 4000 | 6000 |
| | 60 | | 65 | | 55 | | 60 | |

This will bring you back to the Noah 4 page. Choose the **OTO Suite**

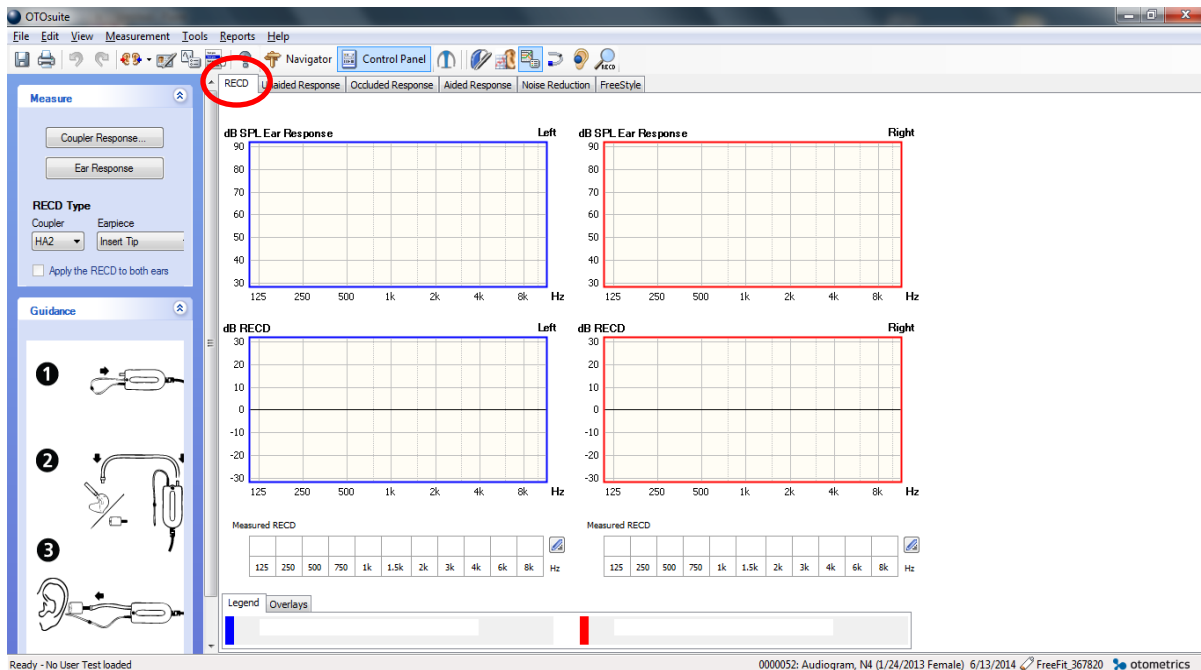
PMM tab  in the top left-hand corner. This will bring you to the OTO Suite page.

You may need to calibrate the probe tube.

Set up:

Choose the <**Measurement Fitting Details**> button  at the top of the page to enter the client's assessment data and indicate that you wish to measure the RECD. For this example we will use the settings shown in the box. If you wish to apply the bone conduction correction, change the option in the box to <**Yes**> and you will be asked to enter the bone conduction thresholds. When you have entered the fitting details, press <**Apply**> and this will bring you to the RECD screen, as shown below.

| | |
|----------------|----------------|
| Fitting Mode: | Coupler |
| DOB: | Equal to 8 mos |
| Applied RECD: | Measured RECD |
| Transducer: | Insert + mold |
| UCL: | Predicted |
| BC: | No |
| Amplification: | Monaural |

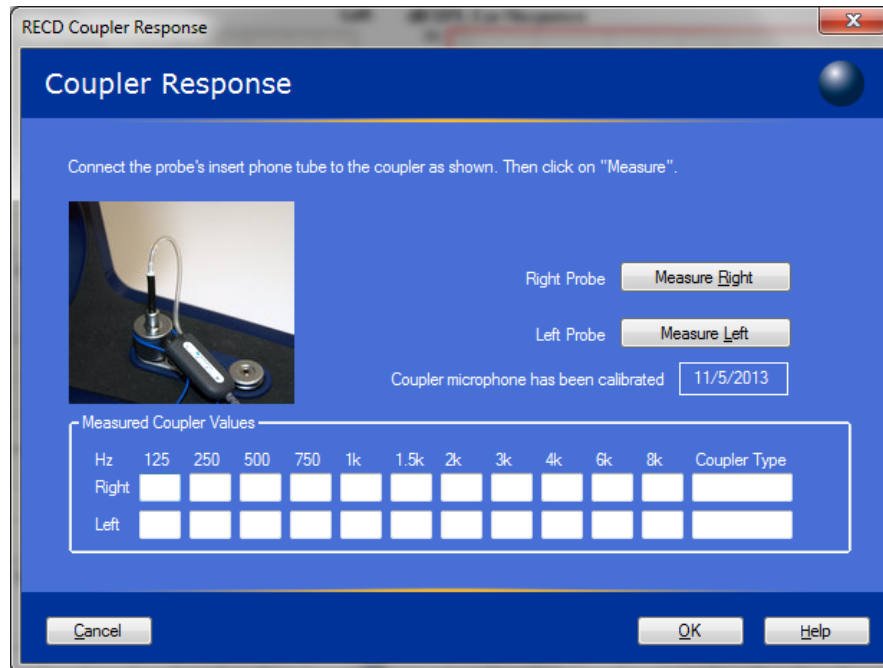


RECD:

Measure the RECD:

Ensure that you are in the **RECD tab** in PMM. Choose the <**Coupler Response**> in the RECD Control Panel on the left. A picture will appear on the screen to model attaching the transducer of the real

ear module to the coupler, as shown in the following figure.



Loop the blue cord around the coupler, tighten the cord and attach the right RECD transducer to the coupler, as shown in the above figure. Once the right RECD transducer is in place, close the box lid and choose the <Measure Right> button. Set up the left RECD real ear module to the coupler using the same steps. Press the <Measure Left> button and click <OK>. Remove the real ear module from the test box and remove the RECD transducer from the coupler.

Measure Real-ear Response:

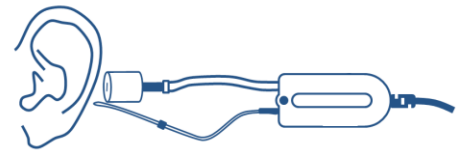
Mark: Mark the probe tube insertion depth by sliding the black ring along the tube to the following depths:



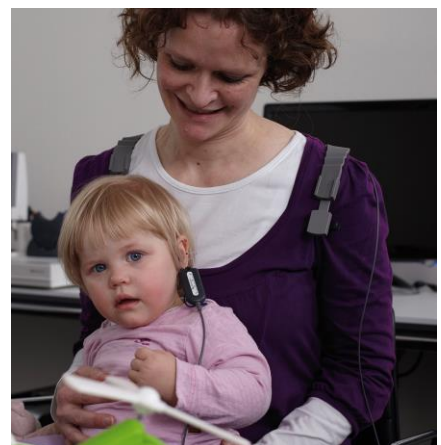
- a. 3 to 5 mm past the end of the earmold (if you have one)
- b. The following distances from the end of the tube are used as guides and can be found on the real ear module measuring scale:
 - ✓ Adult males: 31 mm
 - ✓ Adult females: 28 mm
 - ✓ Children: 15-25 mm

Attach the marked probe tube to the real ear module. Connect a foam tip or ear mold to the transducer tubing. Place the FreeFit® collar around the patient's shoulders.


If the client is a child or infant, you may place the collar around the parent's neck with the child sitting on their lap (as shown in the figure to the right).



Loop the blue cord of the real ear module around the pinna and tighten it up to the earlobe. Carefully insert the probe tube into the client's ear, until the black marker is at the intertragal notch. Use otoscopy (when the marker is still a little further out than the intertragal notch) to make sure that the ear drum is not touched. Place the tube along the bottom of the ear canal if possible. Use lubricant to gently adhere it if necessary.




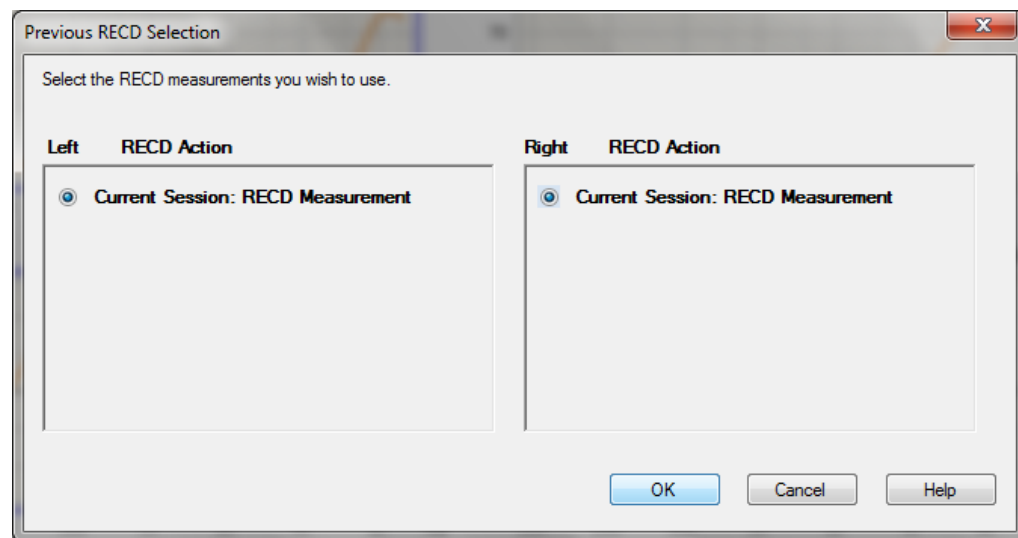
Compress the foam tip and insert it over the probe tube, into the ear. Watch the black marker to make sure it stays at the notch.

Select an ear to measure by pressing the **<Select Measurement Ear>** icon  at the top left-hand corner.


Press the **<Ear Response>** button in the control panel to measure the real-ear response of the RECD.

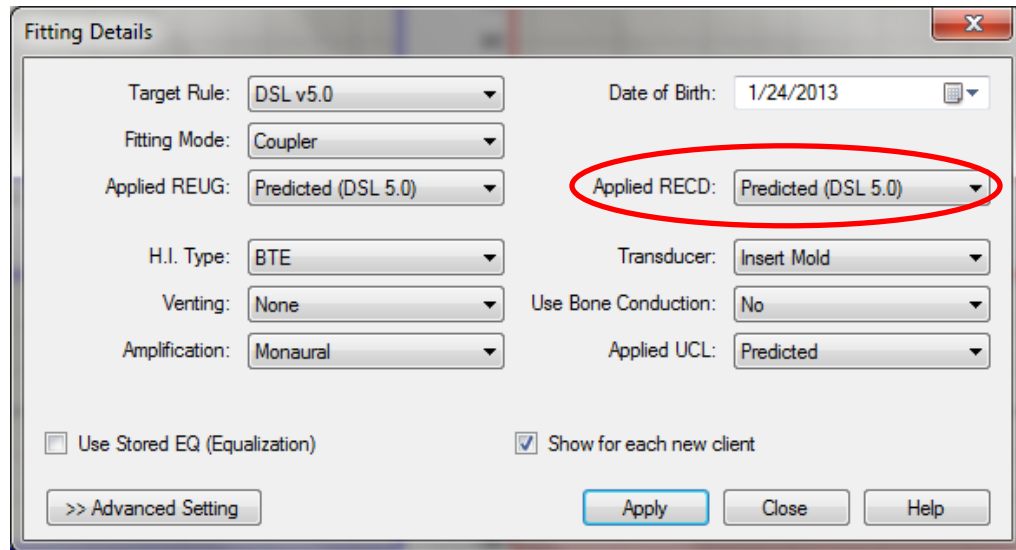
Use Previously Measured RECD:

If you wish to use previously measured RECD values, choose the **<Browse previously measured RECD data>** icon  at the top of the page. Here you can access RECD values from previous sessions stored and use the values for your client.



Use a Predicted RECD:

If you wish to use predicted RECD values, choose the **<Fitting Details>** icon  and change the **Applied RECD** to **<Predicted>**. This will use a predicted RECD based on the client's entered age.



Enter RECD Manually:

To manually enter the RECD, ensure you are in the **RECD tab** in PMM. Enter the client's RECD values in the table below the graphs.

For this example we will enter the following RECD values:

| Frequency (Hz) | | | | | | | | |
|----------------|-----|-----|------|------|------|------|------|------|
| 250 | 500 | 750 | 1000 | 1500 | 2000 | 3000 | 4000 | 6000 |
| 8 | 9 | 11 | 15 | 16 | 14 | 17 | 19 | 18 |

Once you have the RECD values, you can proceed to verify the hearing aid(s) in the coupler.

Setting a hearing aid to DSL prescriptive targets using the coupler approach to verification

1. Press the **Aided Response** tab at the top of the page, which will open the **Hearing Aid Details** window. Change the transducer to **<Insert Mold>** (this means that your VRA was done through the earmold). Choose **<Apply>**.

Fitting Details

| | |
|-----------------------------------|--------------------------------|
| Target Rule: DSL v5.0 | Date of Birth: 1/24/2013 |
| Fitting Mode: Coupler | Applied RECD: Measured RECD |
| Applied REUG: Predicted (DSL 5.0) | Transducer: Insert Mold |
| H.I. Type: BTE | Use Bone Conduction: No |
| Venting: None | Applied UCL: Predicted |
| Amplification: Monaural | |

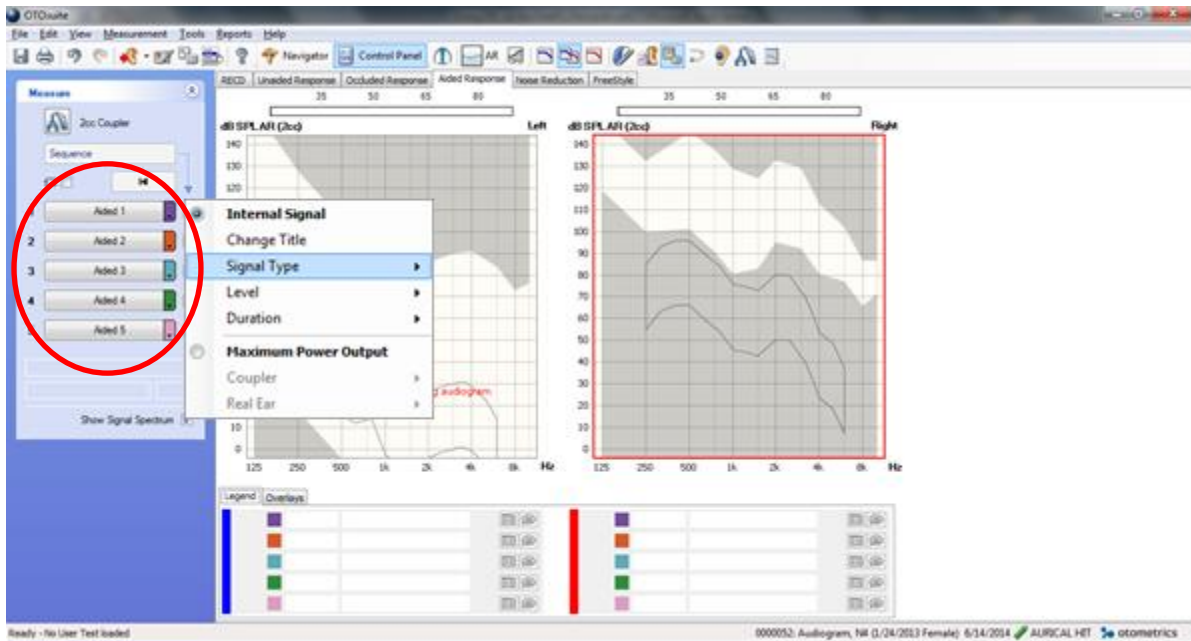
Use Stored EQ (Equalization) Show for each new client

>> Advanced Setting Apply Close Help

2. Set up the hearing aid in the test box, as shown in the figure to the right.



3. Set up the following measures in the menu to the left by clicking on the arrow in the **Aided** boxes. This will access menu options:




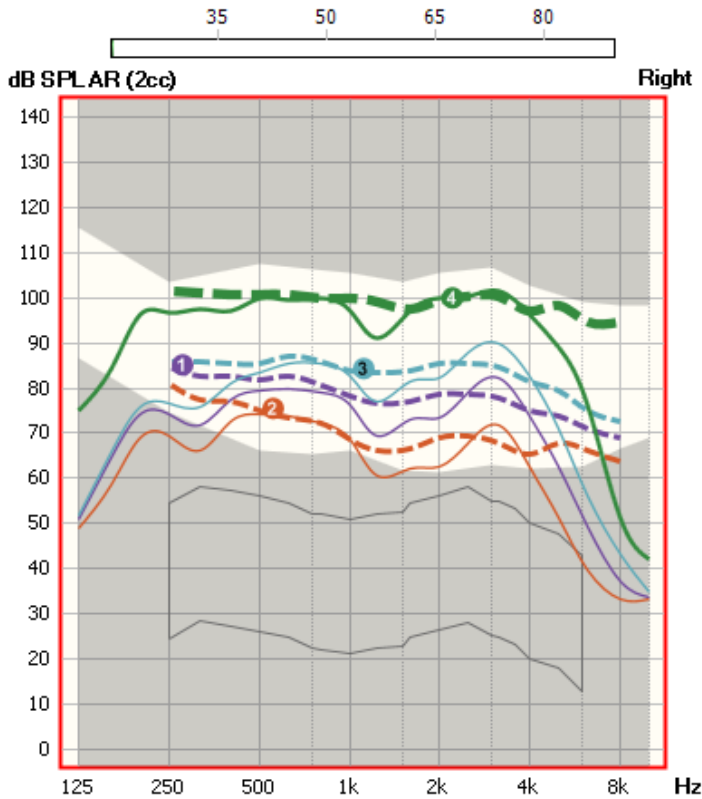
| Drop down | Signal Source | Signal Type | Level | Duration |
|----------------|-------------------------|-------------|--------------------|------------|
| Aided 1 | Internal Signal | ISTS Signal | 65 dB (Average) | 15 seconds |
| Aided 2 | Maximum Power Output | Coupler | 90 dB | _____ |
| Aided 3 | Internal Signal | ISTS Signal | 55 dB (Soft) | 15 seconds |
| Aided 4 | Internal Signal | ISTS Signal | 75 dB (Loud) | 15 seconds |

4. Start the test signal by choosing each aided button. Compare the hearing aid response to the targets for each stimulus. On the graph below, you will see measurements of the hearing aid responses to 55, 65, 75 and 90 dB SPL inputs in the corresponding colours. Adjust the hearing aid gain with the programming software as needed to match the response curves to the targets. When you adjust the hearing aid, ensure that you re-measure the curve.

SII: For each measurement (soft, average and loud speech), the SII value is found in the table under the graph beside the corresponding measurement (see below).













Saving:

You can save the session by choosing the <Save> icon  at the top left hand corner. Your session will save as a time and date.



SII Soft (55 dB)

SII Loud (75 dB)
SII Average (65 dB)

| | | | | | | |
|---|-------------------------------------|----------|-------------------------------|---|---|---|
| 1 | <input checked="" type="checkbox"/> | SII: 56% | DSL V5.0 - 65 (89) dB - IS... |  |  |  |
| 2 | <input checked="" type="checkbox"/> | SII: 36% | DSL V5.0 - 55 (82) dB - IS... |  |  |  |
| 3 | <input checked="" type="checkbox"/> | SII: 68% | DSL V5.0 - 75 (96) dB - IS... |  |  |  |
| 4 | <input checked="" type="checkbox"/> | SII: N/A | DSL V5.0 - 90 (N/A) dB - ... |  |  |  |

The DSL Protocol for Prescribing and fitting hearing aids for infants and children:

- 1) Measure Thresholds with insert earphones. If you will fit a BTE, connect the insert phones to the ear using the child's own earmold.
- 2) Measure the Real Ear to Coupler Difference (RECD), also using the earmold for BTE fittings.
- 3) Use the data from 1 & 2 to calculate DSL targets, setting the hearing aid style and circuit type in the DSL software or electroacoustic test system. Print out a set of targets for the 2cc coupler, including user gain, full on gain, and maximum output.
- 4) Using manufacturer's specifications, choose a new hearing aid that has enough power and flexibility to meet targets and provide compatibility with FM systems, telephones, and/or whatever other listening devices will be used.
- 5) Order the hearing aid.
- 6) When the aid is received, measure it, and adjust it to meet targets using fitting protocols that are appropriate for your measurement system. Coupler-based verification is recommended for children, especially if the RECD has been measured. Speech-like test signals are best for the 55-75 dB range of input level. For MPO, only narrow-band high-level signals should be used.
- 7) FM systems are often used, for home and/or school. Coupling the FM to the hearing aid (via DAI or Telecoil) lets the combined FM/HA system use the hearing aid's frequency response shaping. The AAA 2011 FM protocol is helpful in verifying that this has been done correctly.
- 8) Document your final settings and verification data. Provide the recommended Volume Control setting to the parents if necessary. The use of volume control locks/covers and battery locks/covers are often considered to protect against excessive listening levels and ingestion of batteries.
- 9) Tools for functional evaluation of the hearing aid are available to determine the impact of the hearing aid fitting (e.g., UWO PedAMP)
- 10) Follow children regularly. Retesting of thresholds and RECD is recommended at least as often as earmold changes are made. When the RECD is remeasured, the aid should be readjusted to new targets. Remember that the RECD is affected by middle ear status: perforations or PE tubes will have a large effect on the RECD, and therefore on the fitting as well.

www.dslio.com

dsl@nca.uwo.ca