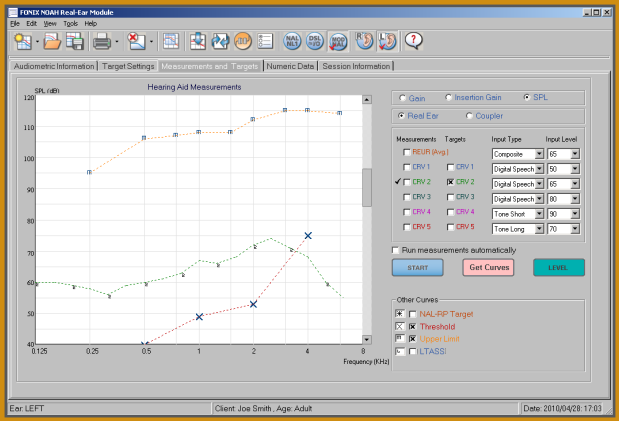
Performing Real-ear Measurements with the FONIX NOAH Real-ear Module



Performing Real-ear Measurements with the FONIX NOAH Real-ear Module

This workbook describes how to use the FONIX NOAH Real-ear Module with your FONIX hearing aid analyzer to perform real-ear measurements.

To open the FONIX NOAH Real-ear Module:

1. Open a patient file in NOAH.
2. Click the **Open Module Selection** button in the NOAH toolbar  .
3. Select the **Measurement** tab and click the **FONIX Real-ear Module** button. This will open the FONIX NOAH Real-ear Module. See Figure 1.

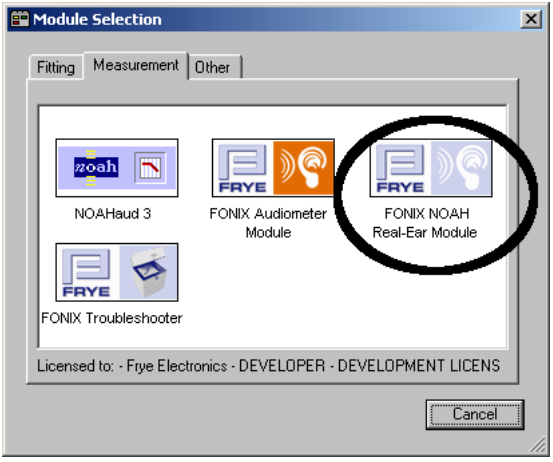


Figure 1: Module selection window

To set up the real-ear target:

1. The FONIX NOAH Real-ear Module will automatically open to the **Audiometric Information** tab. See Figure 2. This window will display the latest NOAH audiogram for the selected patient. If no such audiogram exists, you will need to enter the patient's measured audiogram values in the table below the graph. At a minimum, enter values at 500, 1000, 2000, and 4000 Hz.
2. Enter UCL and bone conduction values, if desired.
3. Click the **Target Settings** tab. Adjust the displayed settings to fit your patient's needs. See the electronic help files in the NOAH Real-ear Module for information about each setting.
4. Select the desired fitting rule in the toolbar. The selected fitting rule will have a red checkmark next to it.

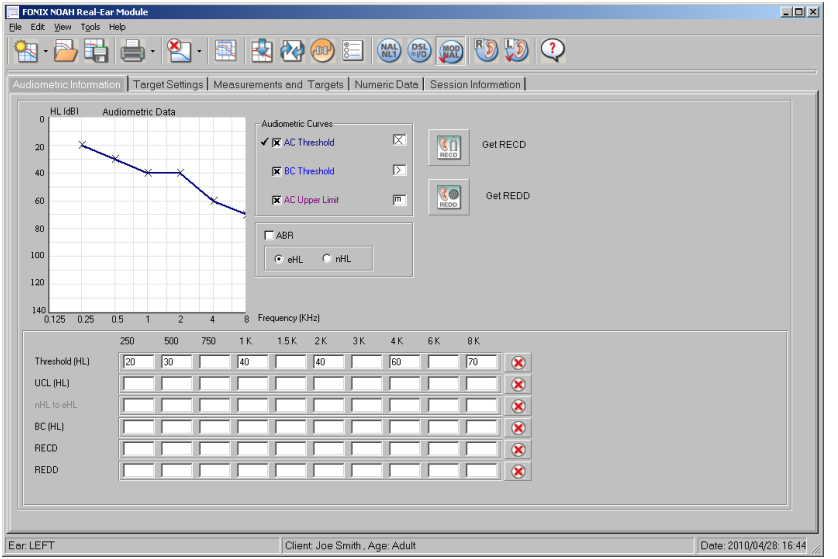


Figure 2: Audiometric Information screen

To perform real-ear measurements with the FONIX NOAH Real-ear Module:

1. Click the **Measurements and Targets** tab.
2. Select **Coupler** or **Real-Ear**, depending on the type of measurement you want to make.

3. Select **Gain, Insertion Gain**, or **SPL**.

4. Place the reference microphone on the patient's ear and insert the probe tube carefully.
5. Click **Level** to level the sound field speaker.

6. (optional) Select the REUR/REUG curve. A checkmark will appear to the left of the REUR/REUG label if it is selected. Click **Start** to measure the unaided response. Click **Stop** when the measurement has stabilized.

7. Insert the hearing aid into the patient's ear, being careful not to dislodge the probe tube. (You can actually level with the hearing aid in the ear as long as it is turned off.)

8. In the **Targets** column, select the check boxes of the targets you want to display. For instance, if you want to display the 65 dB target, select the check box in the **Target** column for CRV 2. This is demonstrated in Figure 3.

   When the SPL test type is selected in step 4, there will be additional curves available in the lower right corner of the window that will allow you to display the patient's thresholds, upper limits, and the LTASS.

9. In the **Measurements** column, select the check box of the curve you want to measure. A checkmark will appear to the left of the current selected curve. (This is also demonstrated in Figure 3.)

10. Use **Input Type** to select the source type of the curve. Choose between Digital Speech, Composite, Tone Long, Tone Normal, Tone Fast, Tone Short. The target for that curve will automatically adjust to fit the selected source type. (Not all analyzers support all source types.)

11. Use **Input Level** to adjust the input level of the curve. Choose between 40 and 100 dB SPL in 5 dB increments. (95-100 dB SPL are only available for coupler measurements.)

12. Click **Start** to start the measurement. Click **Stop** when the measurement has stabilized.

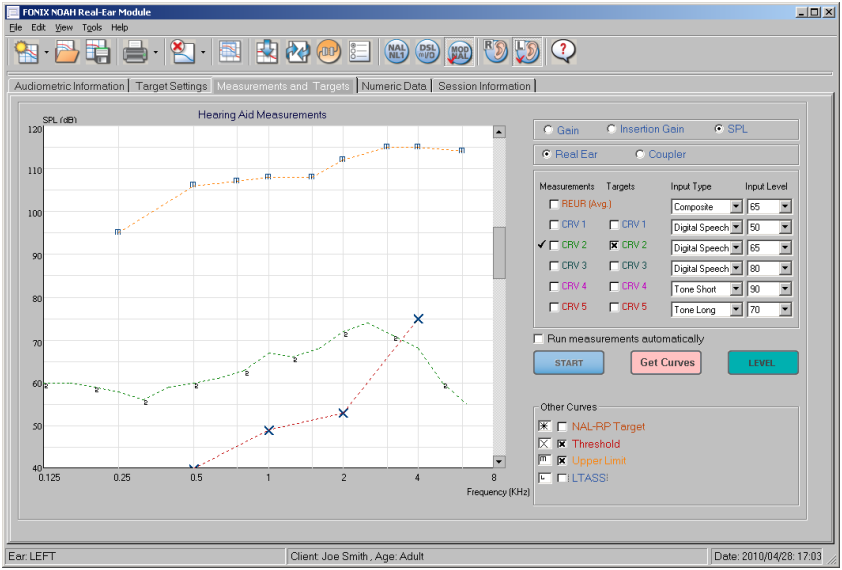


Figure 3: Measurements and Targets screen

Notes on the Measurement and Targets screen:

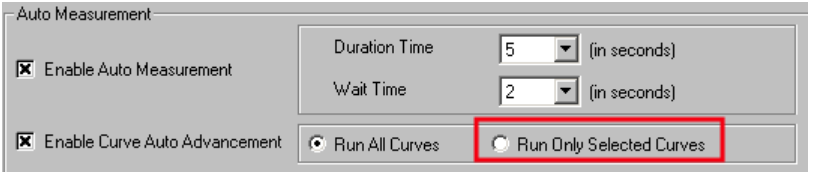
- You can un-display measurement curves and targets by removing the "X" in the checkbox next to each curve. This will not delete the curves; they can be redisplayed by filling in the checkbox again.
- The DSL mI/O "targets" at 85-100 dB SPL are meant to be used as maximum output values instead of actual targets. Therefore, when fitting to the DSL mI/O target, make sure the hearing aid amplification does not exceed the target curves at or above 85 dB SPL. You should NOT match these targets as you normally would a target curve below 85 dB SPL.
- The Unaided curve is automatically set to use the KEMAR average. The label "Unaided (Avg.)" curve label indicates this status. To measure the unaided curve, just select it, and measure it, as described above in steps 5-8. The curve label will be automatically changed to "Unaided (Measured)". No real-ear target is available for this curve.

- All measurement curves displayed on the graph are tied to the source type and level chosen for that curve. Once you have taken a measurement, these settings cannot be changed without deleting the displayed curve.
- The selected curve will automatically advance after a measurement has been successfully completed. To change this feature, adjust the **Enable Curve Auto Advancement** setting in the **Test Settings** tab of the **Settings** window.

To run measurements automatically

It is possible to run measurements automatically using the NOAH Real-ear Module. That is, the program will run either all five measurement curves sequentially without needing user intervention between curves, or it will run only the curves that you have selected.

1. Choose whether you would like to run all five curves in sequence or if you would like to select (fill in the “x”) of only the curves you want to run.
2. Click the **Settings** button. This will open the FONIX NOAH Settings window.
3. Select the **Test Settings** tab.
4. Choose either **Run all Curves** or **Run Only Selected Curves** in the Auto Measurement section. You can also change the **Duration Time** (the time each curve is measured) and the **Wait Time** (the time in between curves).



5. Click **Save Settings** and close the Settings window.
6. Select **Run Curves Automatically** under the Curve box selections. See Figure 4.
7. If you selected **Run Only Selected Curves** in step 4, fill in the boxes of the curves you want to test in the Measurements column of the Curve box. Otherwise, it will run all five aided measurement curves.
8. Level the sound field as described in steps 4-5 of the previous section.
9. Measure the unaided curve, if desired, as described in step 6 of the previous section. This will NOT be part of the automated sequence.
10. Click **Start**. Your selected curves will run automatically in sequence.

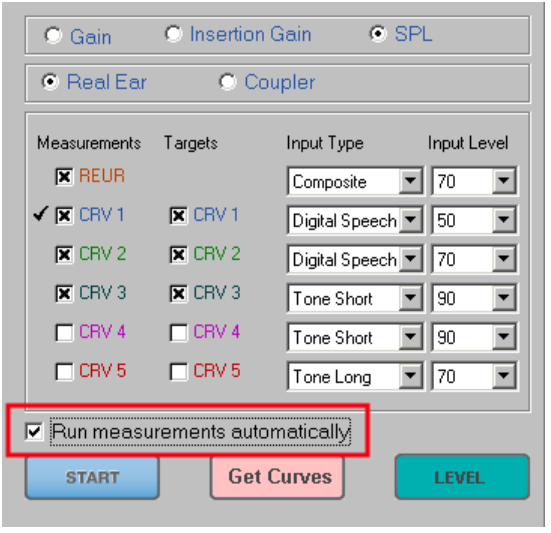


Figure 4: Curve box

To use On Top Mode with another module:

1. Click the **Measurements and Targets** tab.
2. Click the **On Top** button in the toolbar.  This will open the On Top window. See Figure 5.
3. Minimize the main test window and click the 

icon in your Start bar. This will display the Real-ear Module root window with the NOAH toolbar, shown in Figure 6.
4. Click the **Open Module Selection** button. 
5. Open the desired hearing aid fitting module. This module should open up under the On Top window.
6. Switch between the On Top controls and the Start bar controls or just by clicking the appropriate windows. This works best when the hearing aid fitting module and the On Top window are the only active windows and all other open programs have been minimized.

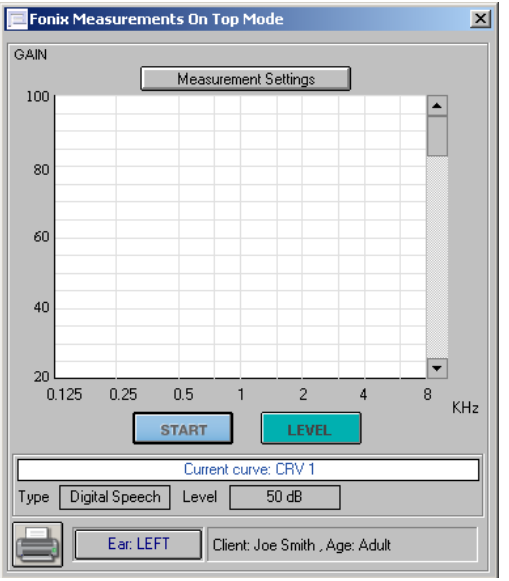


Figure 5: On Top Mode

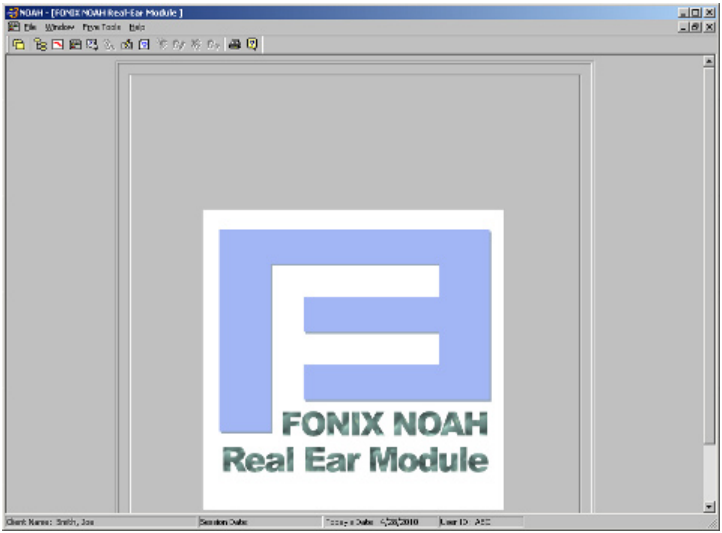


Figure 6: FONIX NOAH Real-ear Module root window

To perform On Top measurements:

1. Set up the hearing aid and/or patient for testing as usual and click **Level** to level the sound field speaker.
2. Click **Start** to measure CRV 1. When the measurement has stabilized, click **Stop**. This will automatically advance the curve selection to CRV 2.
3. Repeat Step 3 for up to five total measurements, as desired.
4. Use the **Print** button in the lower left corner of the window to print current test results.
5. Use the **Ear** button located next to the print button to switch ears.

To change the On Top curve settings:

The curve source type and amplitude can be changed by clicking the **Measurement Settings** button. This will double the size of the On Top window to include curve controls. The controls enable you to:

- Change the current selected curve. A checkmark indicates the current selected curve. Clicking on another curve in the curve controls box will change the selected curve.
- Turn on and off the display of any measured curve. If you have performed multiple measurements that are very similar, it is sometimes nice to temporarily turn off the display of one or more of the curve. Do this by removing the X from the curve listing. This will not delete any measurements. Re-display the curve by filling in the X again.
- Change the input type and input level of any of the five measurement curves.
- Enable the automatic test to perform measurements automatically. See the “To run measurements automatically” section for more details.
- Switch the graph display between Gain and SPL.

To Perform An RECD measurement

The RECD transform consists of two measurements: a coupler measurement and a real-ear measurement. The results of these two measurements are subtracted to get the real-ear to coupler difference, the RECD. The RECD is used to convert real-ear targets into coupler targets suitable for the patient's ear canal.

RECD - Coupler Measurement

This section describes how to perform the coupler part of the RECD measurement. The procedure is different for the 6500-CX and FP40 than for the FP35 and 7000 hearing aid analyzers.

There are four ways to connect the insert earphone to the coupler for the RECD measurement. Make sure to select the method you are using in the **Target Settings** tab.

- HA-2 Tip (BTE without custom mold available): Connect the insert earphone directly to the ear level adapter on an HA-2 coupler.
- HA-2 Mold (BTE with custom ear mold available): Connect the insert earphone to the patient's custom ear mold, and use putty to connect the ear mold to the HA-1 coupler.
- HA-1 Tip (ITE/Canal aid without custom aid available): Connect the insert earphone to an HA-1 coupler using a foam ear tip and Fun Tak.
- HA-1 Mold (ITE/Canal aid available): Connect the insert earphone directly to the hearing aid and attach to the HA-1 coupler.

RECD - Coupler: FP35 and 7000 Analyzer

The coupler measurement part of the RECD on the FP35 or 7000 analyzer is made according to the calibration procedure described in the analyzer's Operator's Manual. The Real-ear module merely gathers this data when the real-ear part of the RECD measurement is performed. Follow the instructions in your analyzer's Operator's manual for instructions.

RECD - Coupler: FP40 and 6500-CX Analyzer

The coupler measurement part of the RECD is taken with a 50 Ohm insert earphone plugged into the external speaker jack of the FP40 or 6500 hearing aid analyzer. Once this measurement has been taken, it will automatically be used for all future RECD measurements, even those taken with different clients.

1. Connect the insert earphone to the appropriate coupler.
2. Thread a probe tube through the probe calibration adapter. The tip of the probe tube should extend no more than three millimeters past the non-ridged end of the adapter. Fix the probe tube in place at its entry point, with a bit of Fun-Tak.
3. Insert the probe calibration adapter into the coupler. See Figure 7.
4. Plug the insert earphone into the external speaker jack on the back of the analyzer.

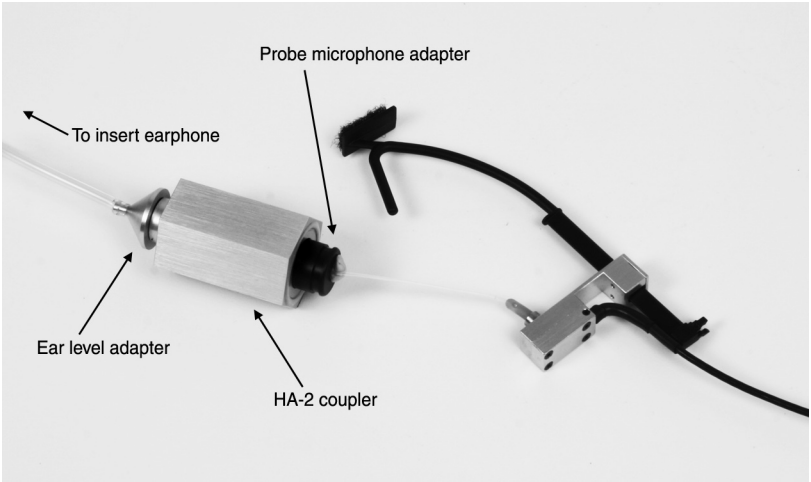


Figure 7: Coupling the probe microphone to the coupler for RECD measurements

5. Click the **Audiometric information** tab in the FONIX NOAH module.
6. Click **Get RECD**. This will open the RECD measurement window. See Figure 8.
7. Select **Coupler**.
8. Select the source level by using the arrow buttons located to the left of the Coupler button. The default level of 70 dB SPL is recommended.
9. Click **Start**. The coupler measurement will be performed.
10. Skip to the real-ear measurement section below.
11. FP40 users should note that the Real-ear Module RECD procedure differs from the FP40's built-in RECD procedure.

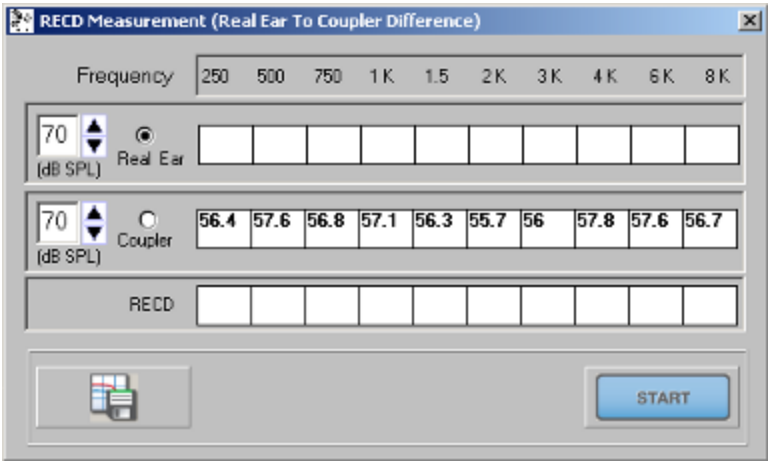


Figure 8: RECD window with the FP40/6500-CX. (7000 and FP35 users will not see the "Coupler" row of this window.

Real-Ear Measurement: All Analyzers

1. Position the ear hook on the client's ear. Attach the probe microphone to the ear hook, if necessary. The reference microphone is not used in this measurement.
2. Insert probe tube into client's ear.
3. If you used a custom ear mold or hearing aid for the coupler portion of the RECD, insert it into the patient's ear canal and connect the insert earphone. Otherwise, attach a foam ear tip to the insert earphone and insert it into the ear.
4. Open the RECD window by clicking the **RECD** button in the Audiometric Information tab. See Figure 8.
5. Select **Real-Ear** in the RECD window.

6. If you are using the 6500-CX or FP40, you can select the source level by using the arrow buttons located to the left of the Real-Ear button.. The default level of 70 dB SPL is recommended, but you should select the level that was used for the coupler measurement. You cannot change the source level used with the 7000 and FP35 analyzers; those analyzers will always use 70 dB SPL.

7. Click **Start**. This will start the pure-tone measurement sweep.

8. Click **Save** to store the test results. This transfers the test results into the Audiometric Information tab, but does not save results permanently into the NOAH database until you save the entire Real-ear Module test results.

9. Close the RECD window. If you performed the coupler measurement, you will be asked if you wish to save it for future use. If you click **Yes**, the measurement will be automatically appear the next time you perform an RECD, even with another patient.

10. Select the **RECD Type** used in the Target Settings tab: HA-1 Tip, HA-1 Mold, HA-2 Tip, HA-2 Mold. See the description of these methods in the coupler measurement section above for more information.
11. Click **Save** to save the results permanently into the NOAH database, if desired.

Note: Once a measured RECD has been input into the Audiometric Information window, the program will automatically use it as necessary. If no measured RECD is available, an age-appropriate average RECD will be automatically substituted.

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