The RECD task involves 4 steps:
1 - Complete Calibration of the Speakers and Probe Tube
2 - Measure an Ear Response
3 - Perform a Coupler Measurement
4 - Apply the RECD Data to your Hearing Aid Fitting

The Real Ear to Coupler Difference (RECD) is used to simulate real ear measurements by coupler measurements and is useful when fitting children or difficult to fit patients

**STEP 1 Calibration**

*Speaker Calibration:* Go to Tools in the top tool bar and select Calibrate Speakers. Hold the probe microphone roughly one-half to one meter (19-39”) from the speakers. Click Start to run the calibration. Increase speaker volume until software no longer states increase volume. If using the REM+ or ARC system, do this for both the right and left probe microphone.

*Probe Tube Calibration:* Go back to Tools in the top tool bar and select Calibrate Probe Tube. Place the tube in the V-notch (which is located on the illuminated portion of the probe microphone). This V-notch will hold the tube in place for calibration. The tip of the tube should be lying directly over the top of the reference microphone in the center (see picture left). Hold the probe microphone roughly one-half to one meter (19-39”) from the speakers. Click Start to run the calibration. Again, if using the REM+ or ARC system, do this for both the right and left probe.

**STEP 2 Measure**

There are two different methods to measure the Ear Response:

*Method A: Using a Hearing Aid*

*Method B: Using an Insert Headset or Button Receiver*

*iMethod A: Ear Response using a Hearing Aid*

- Adjust volume of the hearing aid to moderate comfortable listening level. *Turn the compression and noise reduction circuits off.*
- Position the client roughly one-half to one meter (19-39”) from the speaker, facing the speaker.
- Place the hearing instrument and the probe microphone tube as for all REM measurements.
- Select the green START button to open the measurement type selection screen.

- Choose the Ear Response with a Hearing Aid option.
- Select OK to begin the test and wait until it completes.
Method B: Ear Response with an Insert Headset or Button Receiver

- Plug the Button Receiver into the port labeled Speakers on the REM+ or ARC system. For the REMsp, plug the Button Receiver into the speaker port located at the base of the hardware.
- Place the probe microphone tube as for all REM measurements and use the Button Receiver instead of a hearing instrument. (Add ear tip to Button Receiver).

  - Select the green START button to open the measurement type selection screen.

- Choose the Ear Response with Insert Headset option.
- Select OK to begin the test and wait until it completes.

Once the Ear measurement is complete (whether with a Hearing Instrument or with a Button Receiver), you are prompted to perform a Coupler Response measurement.

STEP 3  Coupler Measurement

There are two ways to measure a Coupler Response:

Method A: Using a Hearing Aid
Method B: Using an Insert Headset or Button Receiver

NOTE: It is important to be consistent with the method used for obtaining the ear response. If the ear response was measured with a hearing instrument, use a hearing instrument for the coupler response. If an Button Receiver was used for the ear response, be sure to use the Button Receiver for the coupler response as well.

Method A: Coupler Response with a Hearing Aid

- Attach the hearing instrument to the REM coupler. The hearing aid settings must be the same as in the Ear Response test.
- Place the probe tube into the customized opening in the side of the coupler.

  - Select START to open the measurement type selection screen.

- Choose the Coupler Response option. If an RECD Measurement curve has already been established from a previous session, select the Use Stored Measurement option if you wish to use that data.
- Select OK and wait until the test completes.
Method B: Coupler Response with an Insert Headset or Button Receiver

- Verify the Button Receiver is plugged into the Speakers port on the REM+ or ARC system or plugged into the speaker port of the REMsp system located at the base of the hardware.

- For the Button Receiver, remove the ear tip and place on the coupler using the body aid coupler attachment piece.
- For the REM coupler, insert the probe tube via the hole on the side of the coupler (see pictures above).
- Select START to open the measurement type selection screen.
- Choose the Coupler Response option. If an RECD Measurement curve has already been established from a previous session, select the Use Stored Measurement option if you wish to use that data.
- Select OK and wait until the test completes.

- The calculated RECD curve is automatically displayed on the screen and is stored in memory for correction of subsequent coupler measurement made from the RECD function. The RECD curve is calculated based upon the Ear Response and the Coupler Response. Simply stated, the RECD curve is the difference between the Ear Response and the Coupler Response.

- For the REM coupler, insert the probe tube via the hole on the side of the coupler (see pictures above).
- Select START to open the measurement type selection screen.
- Choose the Coupler Response option or Use Stored to skip the measurement.
- Select OK and wait until the test completes.
- The calculated RECD curve is automatically displayed on the screen and is stored in memory for correction of subsequent test box measurements made from the RECD function.

Coupler Response in a Test Box

- Attach the hearing instrument (must be the same as in the Ear Response test) to the box coupler.
- Close the box lid tightly.
- Select the Box Coupler button.
- Select START to open the measurement type selection screen.
- Choose the Coupler Response option or Use Stored to skip the measurement.
- Select OK and wait until the test completes.
- The calculated RECD curve is automatically displayed on the screen and is stored in memory for correction of subsequent test box measurements made from the RECD function.

How is the RECD used?

The RECD values are used as a correction to coupler measures for a client's hearing instruments. By performing all subsequent measures in the coupler and applying the RECD corrections to the coupler measures, the real ear factors are incorporated into the results. The resulting simulated measurements provide information to select and make adjustments to the hearing instrument and verify adjustments in the coupler (or the hearing instrument test box) rather than in the uncooperative client's ear. This is particularly important in the case of children, whose small volume ear canals enhance high frequency amplification more so than in average adults. This is an essential consideration in determining the maximum output of the hearing instrument.

If RECD data is present, the software will display an option on the right side of the screen to choose between Ear or Coupler measurement on all Real Ear screens where measurements in a coupler are appropriate. Again, the coupler measurements can be performed in a REM coupler or in a test box (if available).
What do you do with the RECD data?

Once the RECD data is calculated and a curve is established, the data can then be used in most hearing aid fitting software programs. Many hearing aid manufacturers have an RECD section within their fitting software and is used when calculating first fit or auto fit programs.

Within the MedRx REM system, the RECD needs to be exported to a data file. This can be accomplished by following the steps below:

- From the RECD screen, go to File then select Export.
- A Save As window will pop up.
- Name your file accordingly and select Save.
- Once you save the file, it will show the data in raw numbers.
- Place the numbers for RECD Left Ear or RECD Right Ear in the hearing aid programming software in the appropriate locations.

Once the RECD data is recorded in the hearing instrument fitting software, run the first fit or auto fit feature. Once the hearing instrument is programmed, the program can then be measured against a target using traditional real ear measurements or speech mapping within your MedRx REM system.

**STEP 4 Apply The RECD Data**

How do you apply the RECD data to your fitting?

The hearing instrument should be placed in the coupler and positioned within 19-39 inches (one-half to one meter) from the speaker. Place the probe tube inside the coupler (see picture below).

Once the hearing instrument and probe tube are placed in the coupler, a measurement can be taken. In the MedRx REM software, choose the preferred method of measurement, Real Ear Measurement (REM) or Live Speech Mapping (LSM). Select Measuring In: Coupler at the bottom right of the measurement screen.

Press the green Start button to perform your measurement.

Compare the outcome to target and make adjustments if necessary in the hearing instrument fitting software.

It may be necessary to take multiple measurements if adjustments are made to the hearing instrument. Below are examples of measurements matching target that were taken in the coupler with the hearing instrument.
Manual Input

If already known, RECD data can be entered manually. Click Manual button, then click on the plot to enter points.

Click Manual again to finish entering points.

Predicted RECD

RECD can be calculated by prescription rule formulas. Currently only NAL-NL2 is used to calculate RECD data. Select NAL-NL2.

Warning: Predicted RECD calculation depends on many rule parameters, such as patient’s age and gender, HI acoustics, insertion depth and venting size. Make sure these parameters are set correctly in the Rule Setup.

To get to the Rule Setup click on the “Setup NAL-NL2” icon on the right hand side.

Example of rule setup screen options.

*When possible, measuring RECD is preferred over using predicted values.*