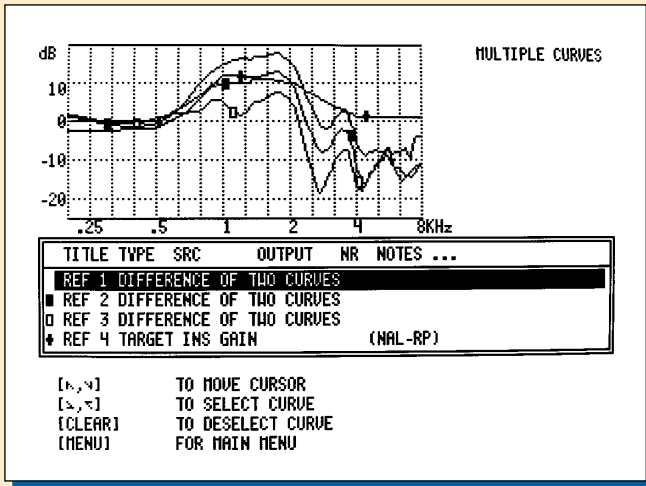


# Using Multi-Curve in Real-Ear Measurements on the 6500-CX Hearing Aid Analyzer



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When fitting WDRC hearing aids, it's often useful to view insertion gain measurements taken with inputs at varying levels. This allows you to verify that the compression characteristics of the hearing aid are working properly.

The following are “cookbook” instructions to using the Multi-Curve function of the 6500-CX while in the Insertion Gain screen.



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# I. Setup

1. Press [START/STOP] on the remote module to enter the real-ear Insertion Gain screen. (You can also press [PROBE] on the main module.) All further key presses will be done on the remote module.
2. Press [MENU].
3. Use the up-down arrow keys to highlight CREATE TARGET.
4. Use the left-right arrow keys to select INS. GAIN.
5. Press [START/STOP] to enter the Audiogram Entry screen.
6. Use the arrow keys to input your patient's audiogram. Select the ear to be tested by using the [MENU] key. Exit the Audiogram Entry menu by pressing [MENU] again.
7. Press [START/STOP] to return to the Insertion Gain screen.
8. Set up your patient for real-ear testing. Use a speaker placement of 45 degrees with a distance of 12-15 inches from the patient's head. Place the larger reference microphone above the ear and insert the probe tube, if desired (probe tube insertion is not necessary for leveling.)
9. Press [LEVEL] to level the sound field speaker. Insert the probe tube if you haven't already done so.

# II. Measuring

1. Press [START/STOP] to begin the unaided measurement. Use the up-down arrow keys to adjust the level of the signal, if desired. 65-70 dB is recommended for unaided measurements.
2. Press [START/STOP] when the measurement has stabilized. You should see the unaided measurement peak somewhere between 2-4k. See Figure 1. If the peak is before 2k, the probe tube is probably not inserted deeply enough.
3. Press [UNAIDED] to save the unaided measurement if you are in MANUAL mode. (Look in the bottom left corner of the screen to determine if you are in MANUAL or AUTO mode.) Otherwise, go to the next step.

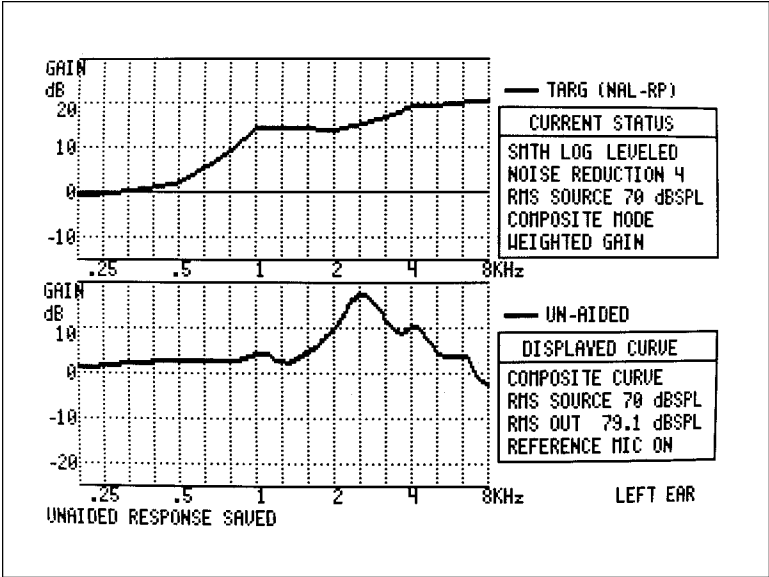


Figure 1—Unaided measurement

4. Insert the hearing aid of the patient, being careful not to move the probe tube.
3. Press [UNAIDED] to save the unaided measurement if you are in MANUAL mode. (Look in the bottom left corner of the screen to determine if you are in MANUAL or AUTO mode.) Otherwise, go to the next step.
4. Insert the hearing aid of the patient, being careful not to move the probe tube.
5. Press [START/STOP] to start the aided measurement. Use the down arrow key to adjust the signal level to 50 dB (or the level that you desired for the “soft” measurement).
6. Press [START/STOP] once the measurement has stabilized. The top graph on the screen contains the insertion gain measurement. The bottom graph on the screen contains the unaided and aided measurements. See Figure 2.

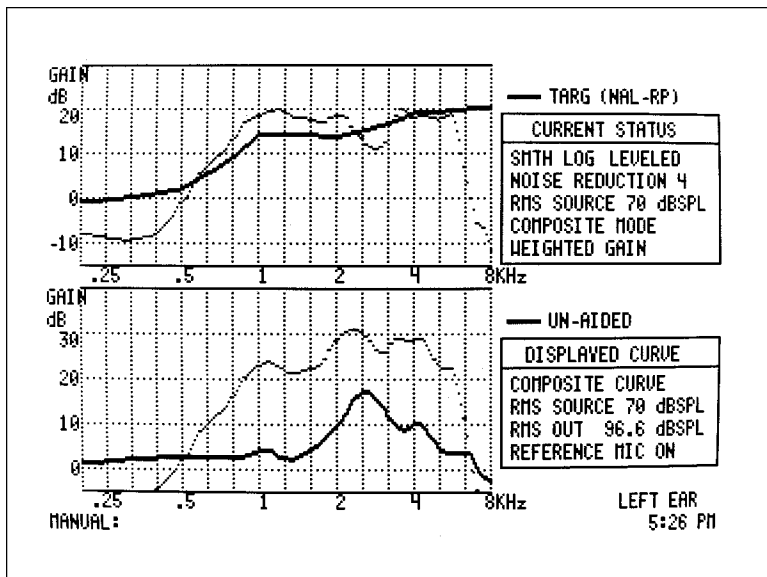


Figure 2—Unaided/aided/IG measurement

7. Press [AIDED] to save the aided measurement if you are in MANUAL mode. (This is not necessary if you are in AUTO mode.)
8. Press [STORE]. This will bring up two columns on the screen titled COPY and TO. See Figure 3.
9. Use the left arrow key to highlight COPY, if it's not already highlighted.
10. Use the up-down arrow keys to highlight REIR in the FROM column.
11. Use the right arrow key to highlight TO.
12. Use the up-down arrow key to highlight REF 1.
13. Press [START/STOP] to copy the REIR to REF 1.
14. Press [MENU] to remove the COPY and TO columns and return to the Insertion Gain screen.
15. Press [START/STOP] to start the second measurement. Use up-down arrow keys to change the source level to 65 dB (or the level that you desired for the "medium" measurement).

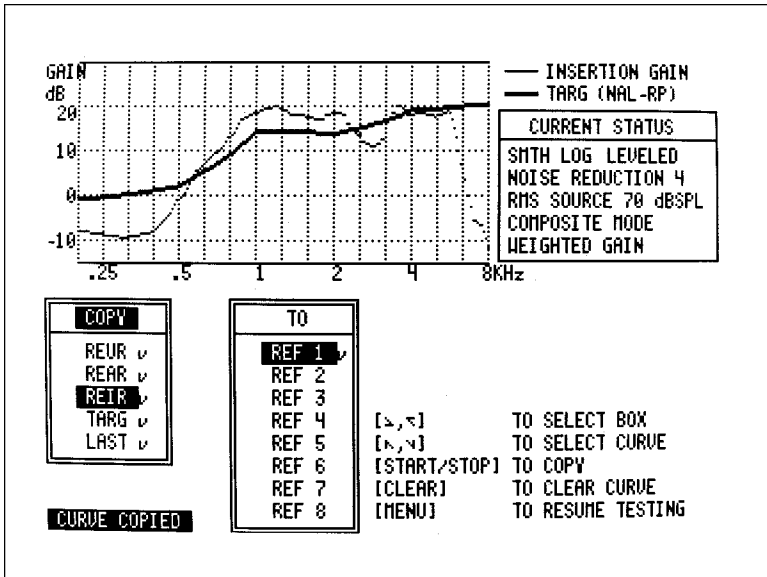


Figure 3—COPY/TO

16. Press [START/STOP] when the measurement has stabilized.
17. Press [AIDED] to save the aided measurement if you are in MANUAL mode. (This is not necessary if you are in AUTO mode.)
18. Press [STORE]. This will bring up the COPY and TO columns again. REIR should be automatically highlighted in the COPY column. REF 2 should automatically be highlighted in the TO column.
19. Press [START/STOP] to copy REIR to REF 2.
20. Press [MENU] to clear the COPY and TO columns and return to the Insertion Gain screen.
21. Press [START/STOP] to start the third measurement. Use up-down arrow keys to change the source level to 80 dB (or the level that you desired for the “loud” measurement)
22. Press [START/STOP] when the measurement has stabilized.
23. Press [AIDED] to save the aided measurement if you are in MANUAL mode.

24. Press [STORE]. This will bring up the COPY and TO columns. REIR should be automatically highlighted in the COPY column. REF 3 should automatically be highlighted in the TO column.
25. Press [START/STOP] to copy REIR to REF 3.
26. Use the right arrow key to highlight TO, if necessary. Use the down arrow key to highlight REF 4 in the TO column.
27. Use the left arrow key to highlight COPY, if necessary. Use the up-down arrow key to highlight TARG.
28. Press [START/STOP] to copy the target curve to REF 4.
29. Press [MENU] to clear the COPY and TO columns and return to the Insertion Gain screen.

### III. Viewing all the curves

1. Press [MENU] to enter the Quik Probe menu.
2. Use the down arrow key to highlight MULTICURVE.
3. Press [START/STOP] to enter the Multi-Curve menu. MULTIPLE CURVE should be highlighted.

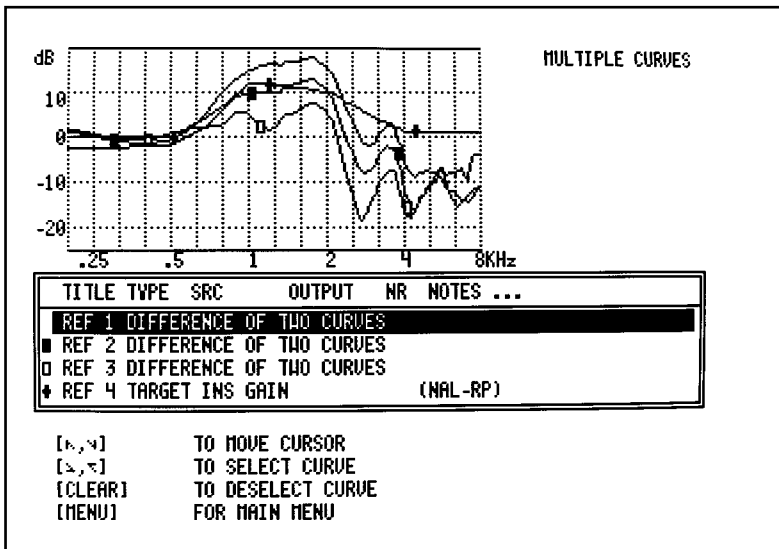


Figure 4—REF 1—REF 4

4. Press [START/STOP] to enter the Multiple curves display. REF 1-REF 4 should automatically be displayed. REF 1 is the “soft” level curve made at 50 dB. REF 2 is the “medium” level curve made at 65 dB. REF 3 is the “loud” level curve made at 80 dB. REF 4 is the target curve. It should usually match up with REF 2, the “medium” level curve. See Figure 4.

## **IVa. Measuring Output in the Insertion Gain screen (Option 1)**

It's also important to measure the real-ear output of the hearing aid with a 90 dB pure-tone swept input. This is used to make sure that the hearing aid doesn't exceed the patient's upper limit of comfort. You can do this in the Insertion Gain screen or the SPL screen. See the next section for instructions on using the SPL screen.

To measure output in the Insertion Gain screen:

1. Press [MENU] from the Insertion Gain screen to enter the Quick Probe menu.
2. Use the up-down arrow keys to highlight MODE.
3. Use the left-right arrow keys to select PURE TONE.
4. Use the down arrow key to select OPERATIONAL PARAM.
5. Press [START/STOP] to enter the Operational Parameters menu.
6. Use the arrow keys to change the SIGNAL LEVEL to 90 dB SPL.
7. Use [MENU] twice to return to the Insertion Gain screen.
8. Press [SWEEP/START] to run a pure-tone sweep at 90 dB SPL. Compare the output to the patient's UCL values measured (or converted) to dB SPL. See Figure 5.

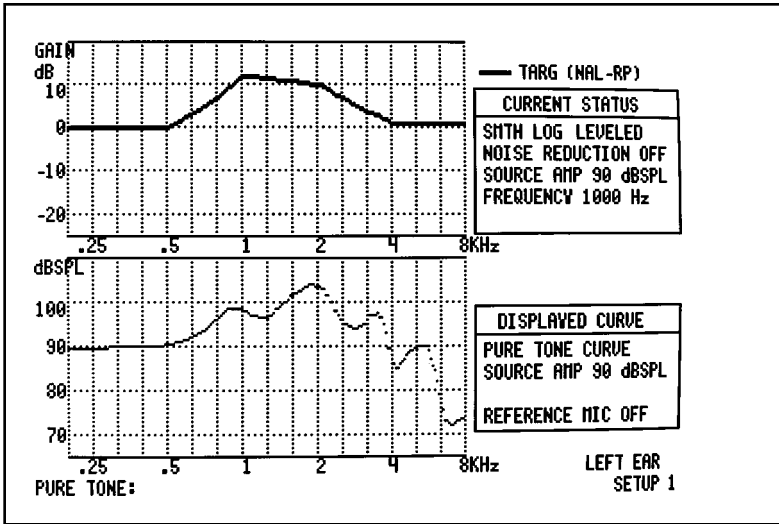


Figure 5—Output measurement in the insertion gain screen

## IVb. Measuring Output in the SPL-o-gram screen (Option 2)

The SPL-o-gram screen will predict the patient's UCL values from inputted HL values. It can also convert UCL values measured in dB HL into dB SPL for easy comparison with the real-ear SPL measurement curve.

To measure output in the SPL-o-gram screen:

1. Press [MENU] from the Insertion Gain screen to enter the Quick Probe menu.
2. Use the up-down arrow keys to highlight CREATE TARGET.
3. Use the left-right arrow keys to select SPL TARGET.
4. Press [START/STOP] to enter the SPL Audiogram Entry screen. The patient's audiogram (entered in the Setup section above) should already be displayed.
5. Press [MENU] to enter the SPL Audiogram Entry menu. You can choose whether or not you want to PREDICT UCL values from HTL values. Press [MENU] to return to the SPL Audiogram Entry screen.

6. Press [SWEEP/START] if you would like to enter measured UCL values in dB HL. (You can't enter UCL values measured in dB SPL.) This will change the audiogram entry display to UCL. Use the arrow keys to enter the measured UCL values.
7. Press [START/STOP] to enter the SPL-o-gram screen. The measured/predicted UCL values will be displayed on the graph as a series of "U"s across the screen.

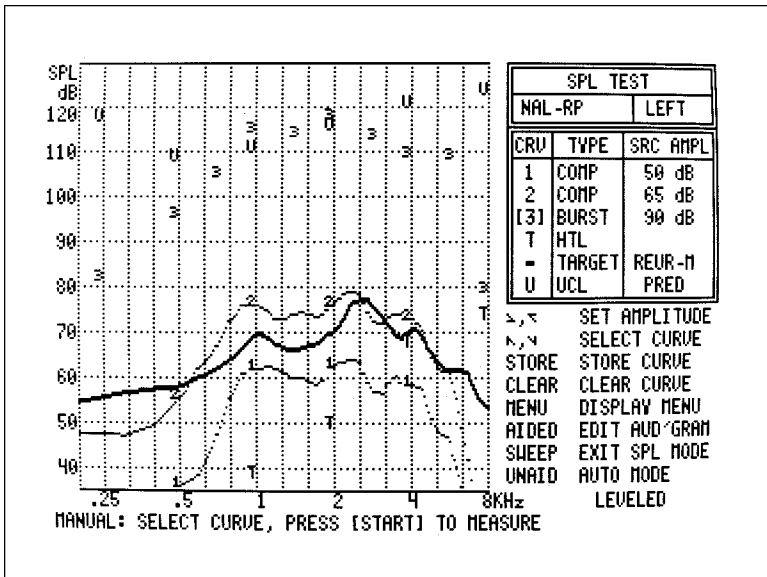


Figure 6—Output measurement in the SPL screen

8. Use the down arrow key to select CRV 3. This will usually be set to a source type of BURST with a source level of 90 dB SPL.
9. Press [START/STOP] to run the 90 dB pure-tone sweep. This is a brief sweep designed explicitly for measuring UCL levels; the measurement only takes a second or two, and it is denoted by a series of "3's" on the screen when finished.
10. Compare the "3's" to the "U's" on the graph. The "3's" should not exceed the "U's" at any frequency. See Figure 6.
11. Press [SWEEP/START] to return to the Insertion Gain screen.

## V. Switching Ears

1. Move the sound field speaker (or rotate the patient) to set up for measuring the patient's other ear. Switch the microphones to the other ear as well.
2. Press [MENU] from the Insertion Gain screen to enter the Quick Probe menu.
3. Use the up arrow key to highlight CREATE TARGET.
4. Use the left-right arrow keys to select INS GAIN.
5. Press [START/STOP] to enter the Audiogram Entry screen.
6. Press [MENU] to enter the Audiogram Entry menu.
7. Change the EAR TESTED. If you would like to clear the existing audiogram, also choose YES for CLEAR AFTER EAR CHANGE. Press [MENU] to return to the Audiogram Entry screen.
8. Use the arrow keys to input the audiogram of the new ear.
9. Press [START/STOP] to return to the Insertion Gain screen. (All existing measurements are be cleared from the screen when the ear is changed.)
10. Press [LEVEL] to re-level the sound field speaker.
11. Follow the instructions in Section II to perform the measurements for the new ear. The three new insertion gain curves can be saved over the existing REF 1-REF 4. Alternately, you can use REF 5-8 to save the curves for the new ear.

If you use REF 5-8 for the new ear, when you reach Step 4 in Section III, use the arrow keys to change the four slots of the display from REF 1-4 to REF 5-8. To do this:

- a. Use the up arrow key to select the first slot of the display, if needed. Use the right arrow key to select REF 5 in the first slot.
- b. Use the down arrow key to select the second slot of the display, and use the right arrow key to select REF 6.
- c. Repeat for slots 3 and 4 to select REF 7 and REF 8, respectively.