

Bimodal Fitting Guide: All Hearing Aid Brands

Program Cochlear Implant (CI)

01

Use the Nucleus® Custom Sound® fitting software to program the cochlear implant. If required, fine-tune the CI MAP for acceptable loudness and sound quality. Write to the processor using the default programs:

- P1 SCAN*
- P2 CUSTOM

**It is recommended that SCAN be made available to any recipient ages 6 years and older, who is able to:*
 1) complete objective speech perception testing in quiet and noise in order to determine and document performance
 2) report a preference for different program settings.

Program Hearing Aid

02

Selection and Fitting: Using the selected hearing aid, choose the prescription of choice (NAL-NL2, DSL etc.). Create at least 2 programs:

- P1 Default Automatic Program
- P2 Omni-directional Program

Verify and Fine-Tune: Using P2, set the gain, MPO and frequency response to meet the prescribed target and complete verification using the tools available in the clinic.

Bimodal Loudness Balance

03

- With the P2 hearing aid program on, turn on the sound processor in the other ear at user-preferred settings.
- Speak to the recipient using a conversational speech level. Apply global gain adjustments to the hearing aid as needed until the sound is reported to be balanced or centered. In some cases, it may not be possible or preferred to achieve equal balance.
- Copy the final hearing aid settings from P2 into P1 and all other program locations.

Workflow for Programming Bimodal Devices: Clinical Recommendations

The workflow below is targeted to fitting a Nucleus device and hearing aid of choice.

PROGRAM THE COCHLEAR IMPLANT:

Using standard procedures with the Nucleus® Custom Sound® fitting software, fine-tune if needed. Write to the processor using default program settings. This will create two programs: P1 SCAN and P2 CUSTOM.

PROGRAM THE HEARING AID:

Selection and Fitting: Consider the recipient's prior hearing aid experience when selecting which fitting prescription to use. For example, DSL is often used for pediatric hearing aid users. NAL-NL2 has been shown to provide suitable frequency response and gain characteristics for bimodal listeners (English et al., 2016). The underlying rationale of NAL-NL2 is to maximize speech intelligibility while ensuring the overall loudness of speech at any level is no more than that perceived by a person with normal hearing. The formula has been derived through ongoing experience and clinical research with NAL-NL1, and incorporates a series of variants according to effects such as gender, listening experience, age and severity of hearing loss (Keidser et al., 2012).

Verify and Fine-Tune:

- It is recommended Real Ear Insertion Gain (REIG) using speech/speech type signals at conversational intensity levels (e.g., 60 dB SPL) be used to confirm appropriate speech audibility based on the prescriptive target selected (Valente et al., 2006). Repeat for loud speech with MPO test at 90 dB SPL. If REIG is not available, fit to simulated gain targets. Check for loudness tolerance with loud impulsive sounds (such as clapping) and also loud speech; make adjustments based on recipient's feedback.
- It is recommended that the hearing aid is fitted to the widest possible frequency bandwidth to ensure optimal speech perception and localization ability (Davidson et al., 2015, Neuman et al., 2013, Zhang et al., 2014).
- Trialing a low-frequency boost or cut program might result in improved sound quality for some bimodal listeners who are having complaints of sound quality (Ching et al., 2004, English et al., 2016).

Bimodal Loudness Balance: With the P2 hearing aid program on, turn on the sound processor in the other ear at user-preferred settings. Apply global gain adjustments to the hearing aid as needed until the sound (conversational speech level i.e. 60 dB SPL) is reported to be balanced or centered (i.e. perceived as located from directly in front of the listener or centered in the head). Copy the final hearing aid settings from P2 to P1 and all other program locations.

COUNSEL AND MANAGE CLINICALLY

The recipient may receive more benefit from the CI than the hearing aid, however it is important to encourage continued use of both devices. Re-evaluate the recipient's performance periodically with the CI alone and the hearing aid alone. If the recipient meets cochlear implant criteria for implantation in the hearing aid alone ear and is not satisfied with their performance, it is recommended the second ear be considered for cochlear implantation.

Ching TY, Incerti P, Hill M., Paula Incerti, and Mandy Hill. (2004) Binaural benefits for adults who use hearing aids and cochlear implants in opposite ears. Ear and hearing 25(1): 9-21.

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English et al., (2016) Fitting recommendations and clinical benefit associated with use of the NAL-NL2 hearing-aid prescription in Nucleus cochlear implant recipients, International Journal of Audiology, (Online 1-6).

Keidser G, Dillon H, Carter L, O'Brien A (2012) NAL-NL2 empirical adjustments. Trends Amplif 16:211-223.

Neuman et al., (2013) The effect of hearing aid bandwidth on speech recognition performance of listeners using a cochlear implant and contralateral hearing aid (bimodal hearing), Ear and Hearing, 34(5).

Valente et al., (2006) Guidelines for the audiological management of adult hearing impairment. Audiology Today, 18(5).

Zhang et al., (2014) Cochlear dead regions constrain the benefit of combining acoustic stimulation with electric stimulation, Ear and Hearing, 35(4), 9-21.

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