

FROM OTICON FREQUENCY LOWERING WHITEPAPER 2015:

25 answers to Speech Rescue™

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1. In which products is Speech Rescue available?
2. When should frequency lowering technology be used?
3. How is Speech Rescue different from Sound Recover and Audibility Extender?
- 4.
- 5.

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| 1. | In which products is Speech Rescue available? | <i>Speech Rescue is available in the new Oticon super power hearing aids in all price points of Dynamo for adults and Sensei SP for children.</i> |
| 2. | When should frequency lowering technology be used? | <i>Frequency lowering should only be used if high-frequency speech is not audible through conventional amplification.</i> |
| 3. | How is Speech Rescue different from Sound Recover and Audibility Extender? | <i>Speech Rescue is unique because it uses a multi-layered lowering technique that overlaps copied segments from a wide region in the high-frequency input in order to present the information in a narrow region along the border of the severe-to-profound patient's usable hearing. With Sound Recover, sounds above a selected start frequency are compressed (i.e. the frequency spacing in a band is reduced) to fit within the audible bandwidth of the patient. Depending on the position of the start frequency and the degree of compression needed, the low-frequency spectra important for vowel identification are likely to be altered, at the risk of creating vowel confusion. Audibility Extender captures a smaller portion of the high-frequency spectrum and reproduces it at a lower spectral position. Speech Rescue also copies and keeps the original high-frequency sound, whereas for Sound Recover and for some variations of transposition the high frequency there is no output in the high frequencies.</i> |
| 4. | Is Speech Rescue default ON or OFF? | <i>Speech Rescue is OFF by default for both children and adults. However, once activated an individual Speech Rescue configuration will automatically be prescribed.</i> |
| 5. | For whom and how is Speech Rescue prescribed? | <i>Speech Rescue is made for people with severe-to-profound hearing loss. When activated Speech Rescue is prescribed to patients with a maximum audible output frequency (MAOF) below 6 kHz. The MAOF is defined as the highest frequency at which the patient can hear conversational speech with amplification.</i> |
| 6. | How does Oticon determine the maximum audible output frequency for prescribing the Speech Rescue setting? | <i>The maximum audible output frequency calculation is part of the prescribed Genie settings. It includes the audiogram, the output level of the device, the rationale, as well as the average spectrum for conversational speech.</i> |
| 7. | If the hearing loss is progressive, will Genie change the prescription? | <i>Yes, any change in the audiogram, which is great enough to result in a shift of the patient's maximum audible frequency, causes an automatic re-prescription of the Speech Rescue configuration.</i> |
| 8. | What about asymmetric losses? | <i>The Speech Rescue settings are prescribed individually for each ear.</i> |
| 9. | Why does Speech Rescue not copy all high-frequency sounds above the maximum audible output frequency and lower this? | <i>The design goal of Speech Rescue is to provide the patient with as much high-frequency information as possible. This means that, in principle, the source region should cover the entire speech spectrum that is unusable to the patient. However, packing too much information in the low and mid-frequency region likely makes it too dense and hence unusable to the patient. Because Oticon strives for the best sound quality and aims to provide the brain with the cleanest and most intact signal possible, the source region for all configurations covers a 3 kHz range (see further details in Speech Rescue White Paper, page 6).</i> |
| 10. | Acclimatisation: How long does it take patients to get used to Speech Rescue technology? | <i>Perceptual adjustment to frequency lowering is likely very individual (Glista et al., 2012). Research done with frequency lowering technology generally allows for a six-week acclimatisation period (Ellis and Munro, 2015). The benefits observed with Speech Rescue on Danish adults (see results in the box, page 10 of the Speech Rescue White Paper) have been immediate, showing on average no requirement for time to adjust to the technology. Further investigations at independent research sites are ongoing.</i> |

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| 11. | Is it possible to activate/deactivate Speech Rescue independently for each program? What about the settings? | <i>Yes, programs where Speech Rescue is ON or OFF, respectively, can be set up in Genie to allow the patient to trial Speech Rescue in an extra program. However, you cannot make different programs with various Speech Rescue settings, e.g. a strong vs. a subtle setting.</i> |
| 12. | Does turning the Speech Rescue ON cause an additional delay in signal processing? | <i>No.</i> |
| 13. | What are the 10 configurations for Speech Rescue and why are there so many? | <i>A configuration is a pair of a source and a destination region. The source and destination regions are linked, and move in concert. Toggling between configurations with the Genie tool allows for movement of the lowered sounds in discrete steps. Oticon has designed 10 configurations to allow for high precision when fine-tuning the Speech Rescue setting to the individual patient's needs.</i> |
| 14. | What is an ERB and how does that relate to the Speech Rescue configurations? | <i>The equivalent rectangular bandwidth (ERB) is a measure used in psychoacoustics, which gives an approximation to the bandwidths of the filters in human hearing (Wiki). The specific Speech Rescue settings complement the natural frequency selectivity of the cochlea (for detail, see page 6 of the Speech Rescue White Paper)</i> |
| 15. | Does the destination region for Speech Rescue always have the same width? | <i>In Hz it is different, but in the ear's own logarithmic scale it is similar.</i> |
| 16. | What is the strength of Speech Rescue? | <i>The strength defines the level of the lowered input signal at the destination region. You can call the strength the "How much do you want to hear that S?" button. The AVERAGE total output level does not change when the strength is turned up or down. This is because the high-frequency sound is first lowered, then added to any existing sound at the destination region and subsequently amplified to the level of the output defined by the rationale.</i> |
| 17. | What are the consequences of increasing/decreasing the Speech Rescue strength? | <i>Turning the strength up will give more emphasis to the high-frequency cues; turning the strength down will make the high-frequency cues more subtle.</i> |
| 18. | How should the audiologist find the appropriate strength of Speech Rescue? | <i>The goal when setting the strength is to balance the perceptual saliency of the lowered signal (that is, is it audible enough for the patient to hear it and to integrate it into the speech stream) and its distractibility (that is, is it so loud that it segregates out of the speech stream). It requires clinical judgment to find the preferred strength for the individual patient since it may depend on the configuration and severity of loss, the interaction with compressive amplification, and the patient's motivation and ability to cognitively handle the additional information provided by the lowered signal. If time allows, find the preferred strength level of your patient by letting him/her listen to running speech while you adjust the strength. If in doubt, leave the setting at default (in the middle position).</i> |
| 19. | Why activate/deactivate the high-frequency bands in the Speech Rescue Genie Tool? | <i>Oticon believes that keeping the wide bandwidth amplification when using frequency lowering is the safer choice, in particular for children. There is always that possibility that some information can be extracted from the high frequencies. Thus, the high-frequency bands are on by default. Choosing to turn off the high-frequency bands may reduce internal perceptual distortion in some patients and will increase the battery life of the hearing aid.</i> |
| 20. | What does Speech Rescue sound like? | <i>Connect headphones to your test box and try listening to it. Generally, normal hearing individuals find the sound of Speech Rescue quite subtle, only slightly increasing the lisp in speech. In studies done so far with hearing-impaired individuals, no negative perceptual effects on sound quality have been found.</i> |

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| 21. Does the Speech Rescue Processor maintain the harmonics? | <i>It is important to preserve low frequency harmonics for speech quality, for perception of pitch cues, and for transmission of low-frequency speech cues. Therefore, Speech Rescue does not alter the natural relationship between the low-frequency harmonics in the destination band. In addition, 1600 Hz is the lowest possible frequency for the destination band in order to minimize interference with low-frequency harmonics during the occasional instances when high-frequency harmonics from the source region are simultaneously present. In addition, within each sub-region of the source region local harmonics are preserved.</i> |
| 22. Verification: How do I verify Speech Rescue using the test box e.g. the Verifit? | <i>Follow the guidelines developed by the PedAmp Lab at Western University:
http://www.dslio.com/?page_id=166</i> |
| 23. How does Speech Rescue interact with Speech Guard E? | <i>Speech Guard E is Oticon's approach to provide gain and compression to the speech signal in a way that makes the speech signal audible but also preserves the details of the speech signal. Speech Rescue replicates speech information in the high frequencies and moves it down into the usable hearing range. Speech Guard will then take the lowered sound and place it within the narrow range of the patient in a way that fully preserves the lowered signal.</i> |
| 24. Why are some features disabled when Speech Rescue is ON? | <i>When enabling Speech Rescue significant resources are used within the instrument to drive this advanced algorithm. Thus, certain features are disabled to make way for Speech Rescue. This means that transient and spatial noise management (Dynamo only), Music Widening, Power Bass and Voice Priority i cannot run simultaneously. If Speech Rescue is On in one program, the features will disabled in all other programs. A choice of feature priority for the individual patient is needed.</i> |
| 25. What clinical evidence exists for the Speech Rescue technology? | <i>The potential efficacy of Speech Rescue on both adult and paediatric test subjects with severe-to-profound loss is currently (Sept. 2015) being investigated at Boys Town National Research Hospital in Nebraska.</i> |

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