References:
The Difference is in the Details

Advanced Bionics technical specifications detail how the world’s cochlear implant technology leader truly stands apart. AB’s breakthrough innovations include impact-resistant implants with unmatched programming flexibility, superior sound processors with waterproof technology, and efficient fitting software with streamlined features that help recipients hear the world as they’ve never heard it before.
The Most Advanced Cochlear Implant Technology

The HiRes 90K™ Advantage implant features the HiFocus electrode family and the most advanced sound processing circuitry in the world. Its sophisticated design provides unsurpassed programming flexibility, nearly unlimited ways to deliver sound, the industry’s highest case impact resistance 1,2, and full upgradeability for access to tomorrow’s innovations without surgery.

Electronic Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Update Rate</td>
<td>90 kHz</td>
</tr>
<tr>
<td>Stimulation Rate</td>
<td>Up to 83,000 pps (software limited)</td>
</tr>
<tr>
<td>Independent Output Circuits</td>
<td>16</td>
</tr>
<tr>
<td>Spectral Bands</td>
<td>Up to 120 sites of stimulation (software limited)</td>
</tr>
<tr>
<td>Telemetry</td>
<td>Bi-directional communication link</td>
</tr>
<tr>
<td></td>
<td>Forward: 49 MHz (AM)</td>
</tr>
<tr>
<td></td>
<td>Backward: 10.7 MHz (FM)</td>
</tr>
<tr>
<td>IntelliLink®</td>
<td>Implant and processor association</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>Neural response imaging, impedance measurements, ESRT, Integrity Testing</td>
</tr>
<tr>
<td>ADC Resolution Sampling Rate</td>
<td>Resolution: 9 bits</td>
</tr>
<tr>
<td></td>
<td>Sampling Rate: 25 kHz</td>
</tr>
</tbody>
</table>

Stimulation Delivery Specifications

- HiRes-P with Fidelity 120™ (paired), HiRes-S with Fidelity 120™ (sequential)
- HiRes-P (paired) and HiRes-S (sequential)
- CIS and MPS Modes

Implant Materials and Dimensions

- Titanium Case: 5.5 mm total profile, 2.5 mm above bone profile with 3 mm bone depth
- Housing: 28 mm x 56 mm flexible silicon
- Weight: 12 grams
- Magnet: Removable for 0.3T and 1.5T MRI scans*
- Telemetry Coil: Gold-plated wire and Platinum-shielded wire in flexible silicon
- Ground: 2 – Case ground and ring electrode ground
- Impact Resistance Value: 6 joules1

Electrode Technical Specifications

<table>
<thead>
<tr>
<th>Electrode Family</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>HiFocus™</td>
<td>HiFocus™ 1j lateral wall electrode</td>
</tr>
<tr>
<td></td>
<td>HiFocus™ Helix™ peri-modiolar electrode</td>
</tr>
<tr>
<td></td>
<td>HiFocus™ Mid-Scala electrode</td>
</tr>
<tr>
<td>Electrodes</td>
<td>16 platinum contacts</td>
</tr>
<tr>
<td></td>
<td>Platinum–iridium wires</td>
</tr>
<tr>
<td></td>
<td>Flexible silicon carrier</td>
</tr>
<tr>
<td></td>
<td>Integrated ground</td>
</tr>
<tr>
<td>Contact Spacing</td>
<td>HiFocus™ 1j: 1.1 mm</td>
</tr>
<tr>
<td></td>
<td>HiFocus™ Helix: 0.45 mm</td>
</tr>
<tr>
<td></td>
<td>HiFocus™ Mid-Scala: 1 mm</td>
</tr>
<tr>
<td>Active Length</td>
<td>HiFocus™ 1j: 17 mm</td>
</tr>
<tr>
<td></td>
<td>HiFocus™ Helix: 1.25 mm</td>
</tr>
<tr>
<td></td>
<td>HiFocus™ Mid-Scala: 15 mm</td>
</tr>
<tr>
<td>Insertion Tool</td>
<td>Yes</td>
</tr>
<tr>
<td>Reusable</td>
<td>Yes</td>
</tr>
<tr>
<td>Recommended Insertion</td>
<td>HiFocus™ 1j and HiFocus™ Helix cochleostomy</td>
</tr>
<tr>
<td></td>
<td>HiFocus™ Mid-Scala round window and cochleostomy</td>
</tr>
</tbody>
</table>

*Center must contact AB prior to MRI procedure
The World's First Swimmable Processor

Neptune™ changes the cochlear implant industry with waterproof technology designed to help recipients hear while swimming, bathing and showering. A sleek, discreet processor styled after popular consumer electronics with an award-winning design, Neptune is fashionable, submergible, and compatible with strategies designed to help patients hear speech clearly, enjoy music, and listen effortlessly.

NEPTUNE™ Sound Processor

**Mechanical Properties**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor Size HxWxD</td>
<td>26 x 18 x 60 mm (1.01 x 0.72 x 2.4&quot;)</td>
</tr>
<tr>
<td>Weight without Battery</td>
<td>20 g (0.7 oz)</td>
</tr>
<tr>
<td>Weight with Battery</td>
<td>32 g (1.145 oz) (average weight of AAA/LR03 battery: 12 g [0.4 oz])</td>
</tr>
<tr>
<td>Neptune Connect HxWxD</td>
<td>17 x 18 x 58 mm (0.67 x 0.70 x 2.27&quot;)</td>
</tr>
<tr>
<td>Neptune Connect Weight</td>
<td>11 g (0.4 oz)</td>
</tr>
<tr>
<td>Auxiliary Input/Output Port</td>
<td>3-pin D/A Euro compatible with Phonak Dynamic FM micro-receivers. 3.5 mm socket with: -Stereo input for battery-powered auxiliary devices -Stereo output for listening check with headphones -Mono input with phantom power for auxiliary microphone</td>
</tr>
<tr>
<td>Processor Tri-Color Status LED (programmable)</td>
<td>Green, orange, and red. Indicators for battery status, microphone status, program position, IntelliLink™ and error status categories</td>
</tr>
<tr>
<td>Neptune Connect Dual-Color Sync LED</td>
<td>Green and red to indicate Neptune and Neptune Connect communication</td>
</tr>
<tr>
<td>Processor Audible Alarms (programmable)</td>
<td>Low battery, depleted battery, loss of lock, error condition, and IntelliLink</td>
</tr>
<tr>
<td>Volume Dial</td>
<td>Present with Neptune Connect attached</td>
</tr>
<tr>
<td>Sensitivity Dial</td>
<td>Present with Neptune Connect attached</td>
</tr>
<tr>
<td>IP68 with processor (without Neptune Connect) and AquaMic Configuration</td>
<td>Operating Temperature and Humidity Range: 0°C to 45°C and 95% non-condensing humidity</td>
</tr>
<tr>
<td>Storage Temperature and Humidity Range: -20°C to 55°C and 95% non-condensing humidity</td>
<td></td>
</tr>
</tbody>
</table>

**Headpiece and Microphone Specifications**

| Headpiece Type                | Universal Headpiece omni-directional headpiece microphone (3g) | AquaMic omni-directional submersible headpiece microphone (5g) |
| Frequency Range              | Range of 100 Hz to 10 kHz |                                    |
| Headpiece Magnets            | Adjustable, up to 5” |                                    |
| Headpiece Cable Lengths      | Cable lengths ranging from 152 mm to 1067 mm (6” to 42”) |                                    |
| Colors                       | Up to four cable colors available: white, black, beige, brown. Multiple interchangeable headpiece color caps |                                    |

**Power Specifications**

<table>
<thead>
<tr>
<th>Batteries</th>
<th>Lithium AAA/LR03: average 19, up to 30</th>
<th>Lithium AAA/LR03 (rechargeable): average 13, up to 21</th>
</tr>
</thead>
</table>
Processing Specifications

Audio Sound Capture 16 bits resolution (Dynamic Range of 96 dB)
Input Dynamic Range (With/without) 20 dB to 80 dB programmable (60 dB default)
Effecive Audio Sampling Rate 17.4 kHz
Automatic Gain Control (AGC) (Enabled-default) Cambridge dual loop AGC
Automatic Gain Control (Disabled) (programmable) Functions as linear peak clipping for signal above the maximum specified system level
Volume Control ±100% electrical dynamic range
Sensitivity Control Programmable: ±10 dB
Stimulation Rate Up to 83,000 pps
Spectral Bands Up to 120 Bands (software limited)
Supported Strategies HiRes-S, HiRes-P, HiRes-S with Fidelity 120™, HiRes-P with Fidelity 120™, CIS, MPS
Speech Enhancement Algorithm ClearVoice™
Telemetry 1.8 Mbps bandwidth (continuous bi-directional)

Compatibility

Implant HiRes 90K™ Advantage Implant Family and CII Bionic Ear
Headpieces UHP and AquaMic
Accessories Audio interface cables, removable color covers and caps, Listening Check™ earbud, swimming cap, carrying case, Neptune Connect wallet, Travel Case and lanyard use.

Neptune Sound Processor

Neptune Connect

Universal Headpiece (UHP)

AquaMic

by Advanced Bionics
High-Performance Hearing with Harmony

A comfortable, behind-the-ear wearing option, Harmony delivers technology that optimizes hearing in the real-world settings that patients encounter every day. Featuring AB’s patented T-Mic™, the industry’s only microphone placed naturally at the opening of the ear, Harmony is designed to provide highly focused hearing while providing easy wireless connectivity to cell phones, MP3 players, and more.

**Mechanical Properties**
- **Weight**
  - 5 g [0.17 oz] (without battery)
  - 14 g [0.49 oz] (220 mAh battery)
  - 17 g [0.6 oz] (410 mAh battery)
- **Size**
  - HxWxD: 54 x 21 x 13 mm [2.13 x 0.8 x 0.5”]
- **Internal Memory**
  - 3 program slots, 512 KiB flash memory
- **Microphone Frequency Range**
  - 150 Hz – 10 kHz
- **Telescopic**
  - Integrated T-Coil
  - Bandwidth: 150 +/- 15 Hz to above 4500 Hz
- **Tri-Color Status LED**
  - Green, orange, and red indicators for battery status, microphone status, IntelliLink™, and error conditions.
- **Volume Dial**
  - Programmable +/-100% electrical dynamic range
- **Moisture Resistance**
  - Normal operation at 93% relative humidity (non-condensing)
- **Operating Temperature Range**
  - 0° to 45°C
- **Storage Temperature Range**
  - -20° to 55°C

**Power Specifications**
- **PowerCel™**
  - 220 mAh Rechargeable Li-ion battery
- **PowerCel Plus**
  - 410 mAh Rechargeable Li-ion battery
- **PowerCel Site**
  - Average 14, range 8 to 19 (high power off)
- **PowerCel Plus**
  - Average 24, range 14 to 41 (high power off)

**Audiometric Specifications**
- **Audiometric Capture**
  - 16 bits resolution (Dynamic Range of 96 dB)
- **Input Dynamic Range**
  - 20 dB to 80 dB programmable (60 dB default)
- **Frequency Range**
  - 250 Hz to 8700 Hz
- **Effective Audiometric Sampling Rate**
  - 17.4 kHz
- **Automatic Gain Control (AGC III) (Enabled, default)**
  - Cambridge dual loop AGC
- **Automatic Gain Control (Disabled)**
  - Functions as linear peak clipping for signal above the maximum specified system limit
- **Sensitivity**
  - +/- 10 dB, 0 dB default
- **Volume Control**
  - +/- 100% electrical dynamic range (programmable)
- **Stimulation Rate**
  - Up to 83,000 pps
- **Spectral Bands**
  - Up to 120 bands
- **Supported Strategies**
  - HiRes™-S with Fidelity 120™, HiRes-P with Fidelity 120, HiRes™-S, HiRes-P, CIS, MPS
- **Speech Enhancement Algorithm**
  - ClearVoice™
- **Telemetry**
  - 1.0 Mbps bandwidth
  - Forward: 1.1 Mbps @ 44.1 KHz (AM)
  - Backward: 120 Mbps @ 17.3 MHz (FM)
Improved Workflow, Enhanced Productivity

SoundWave™ 2.1 delivers all the efficiencies professionals have come to expect from SoundWave 2.0 — AB’s signature fitting software, plus Neptune™ compatibility. By working directly with clinicians, AB developed SoundWave to help improve clinics’ workflow and enhance productivity.

**Equipment Minimum Requirements**

- **Operating System**: Windows XP Home & Pro with SP3, Windows VISTA, Windows 7
- **Memory**: 512 MB RAM, 1024 MB RAM
- **Processor**: Intel Pentium 3 / 600 MHz, P4 800MHz (32-bit) or any 64-bit processor
- **Hard Drive**: 1 GB, 2 GB
- **Graphical Resolution**: 1024x768 16 bit color (65535 colors), 1024x768 16 bit color (65535 colors)
- **Communication Port**: COM port / 115200 bauds, COM port / 115200 bauds

**Fitting, Platform Specifications**

- **Language**: C# .NET
- **Database Structure**: SQL through Microsoft SQL Express/SQL Server 2005, 2008 and 2008 R2

**Database Options**

- **Backup**: Back up
- **Restore**: Restore
- **Select patient filtering options**: Selectable patient filtering options
- **Advanced sorting and filtering capability**: Advanced sorting and filtering capability
- **Reference implant registration capabilities for easy access to self-learning protocols**: Reference implant registration capabilities for easy access to self-learning protocols
- **Import from versions**: 1.6.77, 1.6.98, 1.6.10, 2.x
- **Delete (with automated export capability of the deleted patient file)**: Delete (with automated export capability of the deleted patient file)

**Program Options**

- **Archive**: Archive
- **Upload programs from processors (compatible with previous versions of SoundWave)**: Upload programs from processors (compatible with previous versions of SoundWave)

**Programming Features**

- **Automated Routines**: Electrode impedance measurements, implant association (NetLink™), RF management (Poll) with selectable target voltages, Stimulation pulse width calculation (APW 1, APW 2), Default automated T measurements (T = M / 10)
- **Access to HiRes Fidelity 120™, ClearVoice™**: Access to HiRes Fidelity 120™, ClearVoice™
- **Psychophysical Measurement Features/Options**: Stimulation of individual, groups or all electrodes, Speech Burs™, tone burst and live stimulation, Selectable interpolation option
- **Available Coding Strategies**: CII/HiRes 90K™, Advantage Implant Family, HiRes-S with Fidelity 120™, HiRes-P with Fidelity 120™, HiRes-S, HiRes-P, CIS (simulation), MPS (simulation), C1 (only with Harmony Processor)
- **CIS, MPS, SAS**
SOUNDWAVE™ 2.1
Fast, Efficient, Innovative

Processor Support
CII/HiRes® Advantage Implant Family
Neptune™, Harmony™, Auria®, PSP, CI BTE, PBTE
C1

Harmony

Speech Enhancement Algorithm
ClearVoice® (with Harmony and Neptune through HiRes with Fidelity 120™)

Program Features/Options
M adjustments (with/without stimulation)
T adjustments (with/without stimulation)
Sweep and balance
Gain (+/- 10 dB and pre-configured settings)
Mixing ratios
M dipolar input
IDR (from 20 to 80 dB)
Frequency range (150 Hz to 7.8 kHz)
Volume range (up to +/- 100%)
Sensitivity (+/- 10 dB)
Manual pulse width setting including later pulse intervals
AGC
Selectable manual RF
Extended low frequency capabilities
Selectable multi-color LED functionality for Neptune and Harmony
Selectable multi-color LED functionality for PSP (2 color) and Neptune and Harmony (3 color) processors
Selectable audible alarm (Neptune and PSP)
T-Coil enabling option (for Harmony only), Sensitivity disabling option (Neptune only)

Bilateral Capabilities
Bilateral fitting window with access to all parameters in fitting window listed above
Simultaneously download programs to processors
Simultaneously run impedances and conditioning
Ability to adjust M & T levels while stimulating
Bilateral balance/swap

Other Measurement Specifications
Electrode Conditioning
Stabilizes electrode impedances showing progress

Standard sets of impedance measurements alternating with 4-second bursts of conditioning

Neural Response Imaging
Single channel eCAP
Biphasic stimulation (36 µs/phase)
3.6 Hz stimulation rate
Artifact cancellation using alternate stimulation phases
Default number of samples: 128

tNRI display on fitting windows