SCENIC™

Environmentally Aware
Feature-Packed DSP Hearing Aid Amplifier

INFORMATION SHEET

nanoDSP™ Dashboard

nanoDSP® DASHBOARD IS AN ALL-IN-ONE HEARING aid configuration, setup and diagnostic software tool. The software gives complete control over a device's functionality and allows management of devices throughout their lifecycle. The wide range of features it supports enables the software to be used in many different situations, some of which are listed below:

- Testing algorithm performance
- Creating customized user fittings
- Setup for production automation
- Device configuration
- Device diagnostics
- Viewing behavior of algorithms in real time

nanoDSP® dashboard

nanoDSP Dashboard is for use with *Scenic* hearing aids. The software is tab based, with each tab having its own function. Summaries of the tabs are available on the following pages.

IntriCon
The Body-Worn Device Company
1260 Red Fox Road · Arden Hills, MN 55112 · TEL: (651) 636-9770 · FAX: (651) 636-8944
Kesselschmiedstrasse 10 · D-85354 Freising, Germany · TEL: 049-8161-4804-0 · FAX: 049-8161-4804-18
www.intricon.com

Configuration Files

Configuration Files are used by the software to store a device's settings. Each file contains a complete description of a single device, which can be used to:

- Transfer settings between different devices/locations
- Save the current device state for later restoration
- Load a calibration into a device

These files are normally saved with a .mth extension, although files with different extensions can be loaded as long as they contain valid configuration data.

The settings stored within a configuration file will normally be any data that would be read or writen to a device. As a result, the following information can be included in a file:

- Calibration data
- Device settings
- Firmware configuration (including version numbers)
- Global module settings
- Individual program settings
- Logging module settings
- Manufacturer's Data Area (MDA) settings
- Production automation settings

Loading and Saving Configuration Files

The saving and loading of a configuration file is controlled from the Configuration File tab after a device has been successfully connected. When saving to a configuration file, only data from the currently selected ear will be saved to the configuration file. If two devices are connected simultaneously on separate ears with different module configurations, only the modules relevant to the currently selected ear will be saved. A similar situation applies to loading configuration files. Only data relevant to the current device will be loaded. If the device on the current ear has a different module configuration to the device settings contained within the loaded configuration file, only settings for matching modules will be loaded.

The Configuration File tab also gives the user some control over which settings are saved or loaded from a configuration file. Options are to save or load all device settings; to save or load only the device's calibration data; or to save or load everything except for the calibration data.

Using this functionality, it is possible to transfer only the calibration; only device settings; or both between different devices. For any of these cases, the firmware configuration will always be saved to the .mth file. This allows any configuration file to be used in creating a simulated session.

When a configuration file is loaded, the settings are loaded into the User Interface (UI). To permanently burn these settings to the connected device, the user must open any screen for the settings that need to be burned and click the burn button.

Calibration

The Calibration tab is one of the most important tabs in the software. It is used to setup and control calibration data for several different device features. The ultimate aim of the calibration is to flatten the response of the device across all the calibrated frequencies.

An automatic calibration process is supported for the first five calibration types listed in the box on the following page. During the automatic calibration process, the software controls an attached Frye Fonix test box to produce sweeps, test tones, and to measure the device's output. The collected measurements are used to calculate the various sets of calibration data. It is recommended that the automatic calibration process be used whenever possible, as it has safeguards to ensure that unreasonable calibration values can't be applied. A manual calibration process is also supported for all types of calibration, but the process is much slower and has more scope for user error.

By clicking the *Burn* button, calibration data is stored within the device. It is then accessable anytime program settings are written to the device. This allows the user to specify device settings in terms of desired input, gain and output levels which are then automatically adjusted by using the appropriate calibration values so the specified output level is achieved. Whenever programs are burned to the connected device they are adjusted for the calibration at the time they are written to the device and the calibration values are never accessed while the device is running. As a result, if a device is modified in such a way that it alters one of the calibrated characteristics of the device (e.g. the front microphone is replaced) the device should be recalibrated and the device's stored calibration should be updated. Updating a calibration will also invalidate any previously burned programs that will have been adjusted using the previous calibration values. In this instance, the device settings should be read out and burned back into the device which will cause values to be adjusted using the new calibration.

Mic 1:
Used to calibrate the combined gain of the device's front microphone and receiver. It contains a coarse gain calibration which performs overall adjustment without any frequency dependent shaping, and a fine gain calibration to determine the gain calibration at each frequency. Sometimes this calibration is referred to simply as the gain calibration.

The gain calibration is calculated by first placing the device in a linear gain mode specifying the amount of gain that should be applied (Max Gain setting) with output limiting disabled. A sweep is then performed across the calibration frequencies and the actual gain produced by the device is measured. The difference between the measured gain and the expected applied gain is the gain calibration value.

Output:
This screen is used to determine the output of the device's receiver. It contains a coarse output calibration which performs overall adjustment without any frequency dependent shaping. The fine calibration describes the output calibration at each bin frequency value.

The output calibration is calculated by placing the device in a linear gain mode with output limiting enabled. A gain value is set, so that when combined with the sweep level, the output would be expected to be larger than the maximum output limit. A sweep is then performed and the difference between the measured output and the maximum output limit is the output calibration value.

Mic 2:
This is a single gain difference value between the front and rear microphones (mic 1 & mic 2). The gain difference is assumed to be constant across all front microphone calibration frequencies. This assumption means that the rear microphone calibration for a particular frequency is the front microphone fine calibration value at that frequency plus the gain difference.

Mic Delay:
This calibration specifies the time for sound to travel between the front and rear microphones (mic 1 & mic 2).

Telecoil:
This calibration specifies the gain difference between the telecoil and the front microphone (mic 1).

DAI:
This calibration specifies the gain difference between the DAI and front microphone (mic 1).

FBC Bulk Delay:
This calibration value specifies the delay present in the feedback path for the current device. Its value can be influenced by physical characteristics of the device including the ear hook, microphone position and case shape.

Stimulate

The Stimulate tab facilitates the generation of narrow band noise at specific frequencies. The output-referred level and duration are both adjustable. Like the Input Tone Generator below, the Stimulate function is typically used for in-situ refinement of the hearing aid fitting.

Input Tone Generator

The Input Tone Generator creates pure tones at the specified frequency, input-referred level and duration which are then fed into the signal path. The tone will then be amplified and adjusted according to the current fitting parameters and any enabled modules in the currently selected Program.

Device Configuration

Device Configuration refers to the collection of settings that relate to the overall operation of a device. Typical settings that fall into this category include switch configuration, battery monitoring, beeps and volume control. Additionally, a communications lock is supported. When a device is locked, it can only be connected to by supplying the correct lock code. By default, devices are not locked but can be by burning a key into the connected device. Once a key has been burned, the same key value must be supplied in order to connect to it again.

MDA (Manufacturer's Data Area)

Every device provides a free-form data area that is available to manufacturers to store custom information. It is often used to store data such as additional device information or customer fitting information. It provides a view of the raw byte data contained within this memory area and also allows the user to edit individual bytes. The available size of the MDA is 192 Bytes.

An extended MDA is also available. The extended area is used to store information formatted in a specific way such as device serial numbers. The data in this area can always be read out, but can only be written if a valid security key is provided. Most manufacturers do not need access to this area and should use the standard MDA area to store data.

Program Setup

The settings for each program can be configured individually. The user has the opportunity to select the Input Type and to enable/disable different Modules and their settings. The settings available within the Program tabs are determined by the modules included in the connected device.

Input Type

Examples of inputs include microphones, telecoil, DAI etc. Some input types have flexible settings, others can't be adjusted. Only one input type can be selected at a time. Enabling a different module from the one that is currently enabled will cause the currently enabled module to be disabled.

Module

A module is the collection of settings that directly relate to a specific algorithm or feature of the DSP. For example, a device's feedback canceller and its associated settings would be defined as the feedback canceller module.

Screen Controls

Every module has a check box that is used to enable or disable the module for the current program. It is important to note that there are some restrictions relating to the enabling or disabling of certain modules. Standard modules such as WDRC, Volume and Beep modules can't be disabled.

To view the available settings for a particular input or module, clicking on its name will select it, and any related settings will be displayed in the *Settings* group box.

The main chart or graph displayed on the Program Screen is typically used to adjust the amplification module's settings.

The bottom of the Program screen contains controls that enable screen settings to be transferred to and from the connected device.

The Burn and Read buttons are used to transfer settings to and from the device's permanent EEPROM memory store.

The Activate HA and Mute HA buttons are used to transfer settings to the device's volatile RAM and to turn DSP processing on and off. More information about screen controls can be found in the Help section of the software.

ANSI Test Settings

The ANSI Test Settings tab is an extra configuration screen that is used specifically for setting up device test configurations. The settings on this screen do not have to relate specifically to ANSI tests but can be used for configuring a device for any test situation. The screen does not provide the ability to burn settings permanently to a device but will activate the device using the on-screen settings. This means that the ANSI Test Settings tab is useful for setting up a test configuration without having to permanently burn the settings to a device. The settings on this tab are also saved to configuration files. This allows the configuration files to store different test configurations which can be saved and then reloaded at a later time.

Live Display

Live Display is the real time display of DSP parameters retrieved from a device while it is actively processing sound. Live Display has many uses:

- Engineering diagnostics
- Evaluation of the performance of different algorithms
- Training
- Demonstration
- Visualizing the effects of module settings changes
- Facilitating the tuning of module settings
- Supporting the replication of sounds in the lab

The available Live Display sub-tabs are determined by the modules that are present in the currently connected device and which of those modules are enabled. If a module does support Live Display and has a corresponding sub-tab, it must be burned to the aid (via the Program page) for that tab to be shown. When viewing Live Display, an active program must be selected as the basis for which sub-tabs are to be made available. As the active program is changed, the available sub-tabs will change according to the modules that are enabled in that particular program. When the device is activated, the live information is read based on the settings in the active program and displayed on the current sub-tab.

Scenic has several different types of Live Display, including Acoustic Scene Analysis. These are described on the next page.

Acoustic Scene Analysis

Acoustic Scene Analysis combines Live Display data from several different modules including:

Impulse Noise Reduction
Indicates when the INR module has detected an impulsive sound and has acted to reduce the gain. The amount of gain reduction applied is indicated on the graph.

Wind Noise Reduction
Indicates if wind has been detected and is acting to suppress it.

Environmental Noise Reduction
Shows the current gain suppression being applied by the ENR module. The display is useful for visualizing the difference in suppression applied to soft sounds versus loud sounds.

Adaptive Directional Microphone
Shows a polar plot of the current directional microphone configuration. The user is able to observe the changes in the polar pattern.

Wide Dynamic Range Compression (WDRC)

Input: Shows the instantaneous input level into the WDRC module versus frequency.

Output: Shows the instantaneous output level from the WDRC module. Comparison of the output levels with the input levels shows compression across all frequencies.

2cc Gains: Shows the gain being applied by the WDRC module in each frequency bin. This can be useful for determining the amount of gain or compression being applied by the WDRC module for different input conditions.

Channel I/O: Shows the current input level versus output level for the currently selected channel. The I/O line plotted on the graph is determined by the WDRC fitting.

Adaptive Feedback Canceller

Maximum Stable Gain: Indicates the maximum (likely) stable gain for the current device with no feedback cancelling modules enabled. The Maximum Stable Gain is continuously updated on screen and can be compared against the fitting gains for the current active program. The frequency bin which has the smallest difference between the fitting gain and maximum stable gain is identified with a lowest gain margin label.

The comparison of the maximum stable gain and the current fitting gains has many uses:

1. If the current fitting gains are at or just above the maximum stable gain then this would indicate that the feedback canceller should be enabled as it is needed to achieve a maximum stable gain that will be above the fitting gains.

2. Fitting gains can be adjusted at the frequencies where feedback is most likely to occur. In general, this will be where the lowest gain margin is indicated.

3. The headroom between fitting gains and maximum stable gain gives an indication of the susceptibility to feedback for the fitting.

4. The effect of different venting options can be assessed with respect to changes in the maximum stable gain and headroom.

Filter Taps: The Live Display of feedback filter taps is most useful as an engineering diagnostic tool. The real time visualization of the filter taps allows for the possibility of tuning of the feedback bulk delay at the development stage.

Logging

The Logging tab lists the logging modules that are present in the currently connected device. Every logging module can be enabled or disabled independently as required. Logging modules can have associated logging data as well as settings. The logging data are generally not adjustable, but the settings that are presented can be adjusted and are used to control the way logging modules behave. There is additional information available in the help section of the software.

Production Automation

Production Automation refers to the functionality provided for the mass configuration of hearing aids on a production line. The software is used to set-up a product line's settings and calibration information. This information is saved in a configuration file. A separate software tool, is used to load the configuration details into a device on the production line.

The production automation data contained in the configuration file is grouped into two main categories described below.

1. Device Settings

Any tab which is used to burn settings into a device has its settings used during production automation. Tabs that fall into this category include Calibration (see also Calibration below), Device Configuration, MDA Editor, Program, Logging & Global Modules. The settings on each of these tabs are automatically saved to the configuration file and will be loaded into devices during the production automation process.

2. Calibration:

During the production automation process, there are two options to load a calibration into a device.

(a) Test Box Calibration
This method of loading a calibration is done by performing an automated test box calibration for each individual device. To do this, a Frye Fonix test box must be connected to the PC with the nanoDSP Production Automation software and the hearing aid correctly set-up within the test box.

The automated calibration performed during the production automation process can be controlled using the Production Automation Setup tab from within the nanoDSP Dashboard software.

Using this tab, the settings for each step of the automated calibration can be controlled. Individual calibration steps can also be skipped entirely by clicking the skip check box on the individual steps. To set-up the situation where only a default calibration is loaded (next option) and no automated calibration steps are performed, *Skip* must be checked on each step.

The starting point for all automated calibration steps that are performed during production automation is taken from the calibration that was determined in the Calibration tab. A good default starting calibration will help speed up the automatic calibration process by reducing the the number of iterations required.

(b) Load default calibration
Using this method, the configuration file contains a default calibration which is loaded into the device. The default calibration that will be loaded using the Calibration tab. Whichever calibration is present on this tab when the configuration file is saved will be the default calibration that is loaded into the device during the production automation process. This particular method for loading the calibration is typically used if the manufacturing tolerance between devices is sufficiently low to allow use of a single default calibration.

Production Automation

The automatic setup of devices using a configuration file is performed with the standalone nanoDSP Production Automation software. This software has its own installer and can be installed on the same PC as the nanoDSP Dashboard or a separate PC.

The Production Automation tool will always burn data for both device settings and calibration. It is not possible to configure just one type of setting.

Simulation Mode

The simulation mode allows the user to connect to a simulated device and run the software as if they have just connected to a real device. A configuration file is used to describe the configuration of the device to be simulated and it must be supplied to the software when connecting in simulation mode. Not all functionality will be available when operating in simulation mode including read functions and Live Display.

A major advantage of Simulation mode is the ability to set-up a configuration file without having to connect to a real device or have one present at the PC where the configuration is created. This is done by connecting a previously created configuration file that represents the type of device to be configured.

Once connected, the required device settings can be changed and then saved to a configuration file using the Configuration File tab.

After having saved the configuration file, the settings contained within it can be transferred to real device.

Creating configuration files to use for simulation

Any .mth file saved using the Configuration File tab can be used for simulation. To create a file, you must first connect to the device you wish to simulate. Configuration files always include DSP configuration information and a description of the modules present in the device (see the Program setup section for a description of modules).

Connecting in simulation mode

To connect in simulation mode, select Simulation in both the Hardware Type and Programmers list box and click the Connect button. You will then be prompted to select a .mth file to use as the simulated device.

Technical Specifications

Operating System: Microsoft Windows XP (SP2 or later); Microsoft Windows Vista (32 bit only); Microsoft Windows 7 (32 bit only)

Display: 1024*768 or higher resolution

Other: Requires .NET3.5; Administrator privileges are required

Supported Programmers: Hi-Pro; Microcard; NOAHLink; Communications Accelerator Adaptor