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Evoke

APPLICATION NOTE

INTRODUCTION

Evoke is a feature on selected ON Semiconductor pre-configured products which allows hearing aids to play alerting acoustic indicators that are richer and more meaningful than simple tones played out consecutively. These acoustic indicators are played out whenever one of seven pre-defined events occurs on the hearing aid. A total of eight acoustic indicators are available for indicating events, and a specific indicator can be mapped to more than one event. The list of events includes: four memory selections, digital volume control up and down behaviour, digital volume control at maximum and minimum values and low battery level.

An Evoke acoustic indicator consists of up to four faded simple tones or six damped tones, with each tone's frequency, amplitude, start time, end time, and decay rate (optional) configured independently. A damped tone starts at its maximum specified amplitude value and decays with time in an exponential matter. A total duration must also be specified for each indicator, allowing some time for a period of silence following the end of the audible tones. With this flexibility, alerting sounds such as musical chords, short melodies and telephone dial tones are easy to create.

There are two ways of modifying the indicators that are stored in the part. The first is through the automated Evoke Editor in IDS. The second is a manual method for advanced users. The two methods are outlined below.

EVOKE EDITOR

The Evoke Editor is a tool that is launched from IDS. Once connected to a device that supports Evoke, the Evoke Editor can be launched by selecting **Tools > Evoke Editor**. A screenshot of the Evoke Editor is shown below.
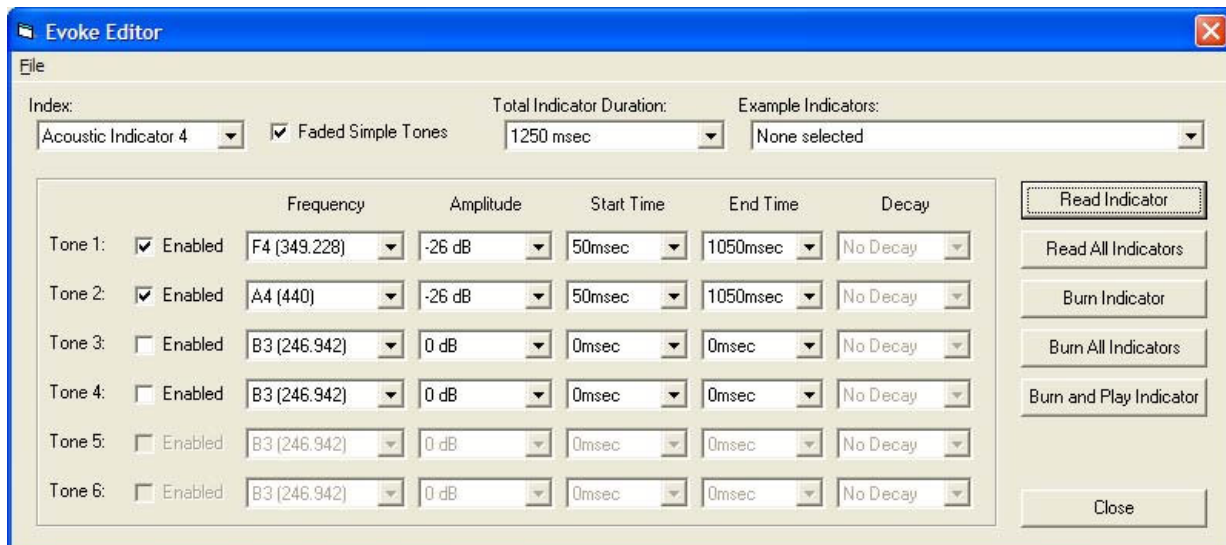
Evoke currently supports eight custom acoustic indicators. Using the product library in IDS, each of the seven events can be assigned an indicator. A single indicator can represent multiple events if desired.

Reading the Acoustic Indicators from a Device

Selecting an acoustic indicator from the **Index** drop-down list allows the user to choose which of the eight acoustic indicators to view or edit. The **Read Indicator** button will read the selected indicator from the connected hearing aid and fill the table of tone values with the read information. The **Read All Indicators** button will read all the indicators from the hearing aid and load the information for each indicator. After performing this step, selecting any indicator from the list will display the indicator data that is stored in the part, unless the user has modified it at any point.

Creating Acoustic Indicators

Rich and sophisticated sounds can be created using the Evoke Editor. Two types of tones can be created: Faded Simple Tones that have fade-in and fade-out transitions (similar to legacy pure tones from older products), or Damped Tones that decay with time in an exponential matter. An acoustic indicator of up to four faded tones can be created by selecting the **Faded Simple Tones** checkbox. Otherwise, the acoustic indicator is created with up to six damped tones. The amplitude of a damped tone will decay to 37% of its original value after the time specified in the **Decay** column has elapsed.

NOTE: The **No Decay** setting exhibits a very small decay with time. The **Decay** column is disabled when **Faded Simple Tones** are enabled.

All enabled tones are played in the user-selected sequence to produce a sound. By having different start times and end times for tones, the user has full flexibility with regards to rhythm and duration of the tones. To control the start and end times of a tone, select a suitable value from the **Start Time** and **End Time** columns, respectively. These values represent the time that the tone will either start or end. The total length of the acoustic indicator is controlled by selections from the **Total Indicator Duration** drop-down list. It is important to note that end times must always be greater than start times for all enabled tones. In addition, it is suggested that the total indicator duration always be greater than the largest end time for any enabled tone in the sequence. This suggestion is in place in the software to ensure all enabled tones get played to completion.

The volume of the tone is controlled using the **Amplitude** column. This feature allows certain tones in the sequence to be louder or softer than others. Also, this setting controls the overall volume of the indicator. To increase or decrease the volume of the indicator, adjust the amplitudes of all the enabled tones accordingly. To avoid tone distortion, high amplitude settings (i.e. greater than -6 dB) should be avoided when selecting a frequency greater than 4000 Hz, or when two tones are to be played out simultaneously.

The frequencies of the tones used to create an Evoke acoustic indicator can be controlled by selecting a desired frequency from the **Frequency** column. All the frequencies listed are in Hz. All individual tones will be pure tones with a frequency equal to the selected frequency in the drop-down list.

NOTE: The available frequencies in IDS are notes from the musical scale. Some legacy frequencies at the upper range of the frequency spectrum are also included in the list.

Example Indicators

The Evoke Editor comes packaged with a selection of acoustic indicator examples. Selecting an example indicator from the **Example Indicators** drop-down list loads the settings from the example indicator into the table of tone values for the selected acoustic indicator index. From this point, the acoustic indicator can be edited and burned into a device.

For example, if the **3 pulses of North American busy signal** example indicator is selected, the table of tones should appear as shown below. The indicator is made up of six tones, three pairs of tones that start and stop at different times. This configuration effectively creates three pulses in a sequential order. Each pair represents a single pulse of a busy signal. The time in between the pulses represents the silent spaces in a busy signal.

Each busy signal pulse is made up of two tones - a B note and a D# note - that are close to the standard busy signal frequencies. Each pulse lasts 500 milliseconds and has a decay rate of 500 milliseconds to fade out each tone.
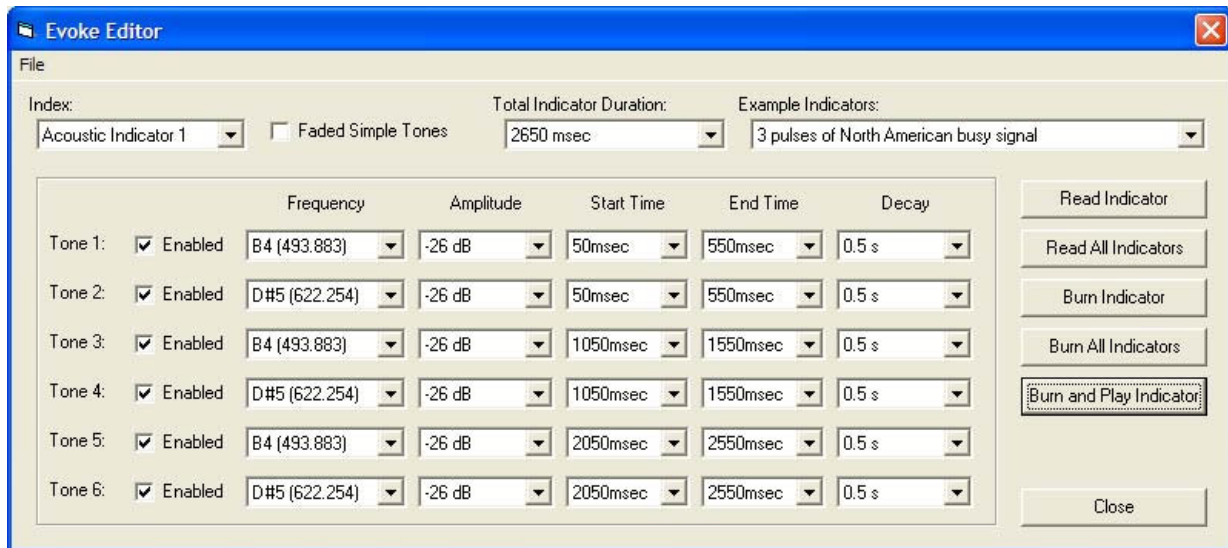
Burning Indicators

Once the user has finished creating a given indicator, they can play it on the device to see what it sounds like. The acoustic indicator can only be played on the hearing aid. As such, the indicator must be burned into the device first. Burning an acoustic indicator overwrites the acoustic indicator that was previously in the device. If the user wants to maintain the existing indicator in the device, they must ensure that it has been saved to an Evoke File (see section Loading an Saving Indicators) prior to playing or burning the new indicator.

The **Burn and Play** button will burn the selected acoustic indicator into the device and play it. The **Burn Indicator** button will burn the indicator but will not play it. The **Burn All Indicators** button will burn all the indicators into the device.

Loading and Saving Indicators

A set of Evoke acoustic indicators can be saved for later use by selecting **Save Indicators to File** or **Save Indicators to File As** from the File menu. All the acoustic indicators will be saved to an XML file (*.xml). By selecting **Load Indicators**, a set of acoustic indicators can be loaded from a previously saved file. The indicators are also saved when an IDS file is saved. An IDS file (*.ids) is the file that the Interactive Data Sheet saves its settings to for use in Cal/Config. When an IDS file is saved, all of the data from the Evoke Editor is saved as well. Conversely, when an IDS file is loaded, all of the acoustic indicator data is loaded into the Evoke Editor and can be seen when the Evoke Editor is launched.

MANUALLY CHANGING FREQUENCIES (FOR ADVANCED USERS ONLY)

Occasionally, a frequency may be required for a particular tone that is not included in the list of frequencies in the Evoke Editor. There is a manual process by which any frequency in the allowable range can be used for any given tone.

The procedure to manually change the tone frequencies involves editing the text of an IDS file. After the acoustic indicators have been created using the Evoke Editor and the indicators have been saved to an .ids file, this file can be opened using a text editor such as Notepad. In the <indicatorconfig> section of the .ids file, the eight acoustic indicators and their corresponding tones are listed.

By changing the value following the *freq* tag, the frequency can be modified for that tone. The frequency can be an integer or floating point number, but the numbers must be within a given range.

NOTE: There will be no error checking for this manual method so these ranges must be followed carefully if modifying the .ids file by hand. For a 16 kHz product, the frequency must be between 125 and 8000 Hz. For a 32 kHz product, the frequency must be between 125 and 16000 Hz.

Once the manually modified .ids file is saved, it can ONLY be burned into the device using Cal/Config or custom user-written software. The device will then play the acoustic indicators with the new tone frequencies. After manually

changing the tones to new frequencies, they will not be recognized by the Evoke Editor. If a manually modified .ids file is opened, the Evoke Editor will change any unrecognized frequencies to the lowest available frequency in the list. If the .ids file is saved at this point, the manual settings will be lost. Therefore, manually changing the tones must be the last step in the process of creating an acoustic indicator.

IMPORTANT NOTE:

> When you manually change tones they will not be recognized by the Evoke Editor but can be burnt into the part using custom user-written software or Cal/Config.

As an example, the XML structure for the first indicator in a particular IDS file is shown below.

<indicatorconfig>

  <indicator index="0" faded="0" totaldur="17">

    <tone index="0" freq="523.251" amp="20" start="1" end="15" decay="4"></tone>

    <tone index="1" freq="246.994" amp="50" start="1" end="1" decay="0"></tone>

    <tone index="2" freq="246.994" amp="50" start="1" end="1" decay="0"></tone>

    <tone index="3" freq="246.994" amp="50" start="1" end="1" decay="0"></tone>

    <tone index="4" freq="246.994" amp="50" start="1" end="1" decay="0"></tone>

    <tone index="5" freq="246.994" amp="50" start="1" end="1" decay="0"></tone>

  </indicator>

…

</indicatorconfig>

If the user wants to change the frequency of the first tone to a frequency that is not supported by the Evoke Editor, they could change "523.251" to "575.1". When the file is saved and burnt into a part, the frequency would be 575.1 Hz for the first tone of the first indicator.

As a final note, it is possible for a software developer to interface directly with Evoke using the ARK API. This may be necessary if one wants to read and burn manually modified acoustic indicators into a device. The methods used to do this are described in the ARK API Document.

PUBLICATION ORDERING INFORMATION