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Ayre™ SA3291 Getting Started Guide

Introduction

Ayre SA3291 is a pre−configured wireless DSP hybrid designed for use in hearing aids.

Ayre SA3291 is designed to work in multi-transceiver wireless systems that can include capabilities such as streaming audio (stereo or mono), binaural telecoil, and remote control of volume and Memory Select (MS) between two hearing aids and a relay device. Ayre SA3291 can also operate in a binaural system where there is no remote control or relay device present.

This application note describes how to configure Ayre SA3291 for use in standalone binaural systems, as well as for use in systems which include a remote control or relay device.

Quick Start Wireless Configuration

1. Connect the device for programming using the desired programming box connected to a PC.
2. Launch the Interactive Data Sheet (IDS).
3. Configure the wireless parameters on the Settings tab (see section "Setting Tab Wireless Parameters")
4. Select the wireless or non-wireless front end mode as required on each Memory Select tab (see section "Memory Select Tab Wireless Parameters")
5. Enable or disable streaming as required on each Memory Select using the Wireless tab (see section "Wireless Audio Streaming")

Near Field Magnetic Induction (NFMI) Wireless System Overview

Ayre SA3291 utilizes NFMI to allow two or more devices to exchange audio signals and control information.

Each device has a programmable address to distinguish which device should be allowed to receive a particular signal. The address consists of a Vendor ID, Network ID and a Device ID, each of which can be programmed using IDS.

There are two basic modes of communication that the devices use to talk to each other, with each method having its own unique characteristics.

- **Network Mode**: This mode places all devices in a network where information can be exchanged back and forth.

The network mode is used when one hearing aid wants to send an audio signal, such as a telephone telecoil audio signal, to the hearing aid on the opposite ear, or when one hearing aid wants to send a volume up or down command to the opposite hearing aid. Network mode is primarily a two−way mode, where devices are exchanging information back and forth. This mode can operate only over a small distance due to the small antennas used in the hearing aids.

- **Blast Mode**: This mode is used for one−way communications between a relay device or a remote control, and all hearing aids within its transmission range that have the same vendor ID and network ID.

Blast mode is primarily a one−way mode, with the blast master streaming audio or commands to all hearing aids within its range. Blast mode devices can operate across a greater distance due to the larger transmit antenna and greater transmit power.

A receiver must be configured in IDS to allow streaming audio or remote control commands to be received.

Ayre SA3291 Wireless System Setup using IDS

Before setting up the system using the instructions in the following sections, Ayre SA3291 should be connected to a programming device as shown in Figure 1 and the Interactive Data Sheet program should start on a Windows PC.
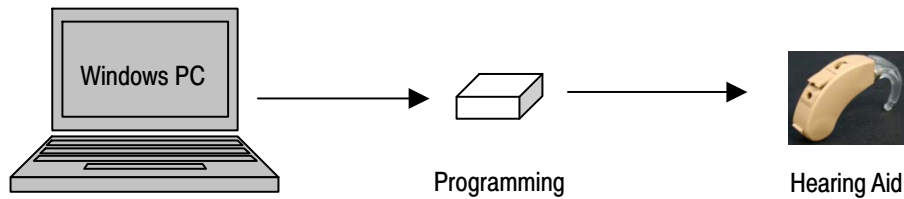
Figure 1. Wireless Configuration using IDS

Ayre SA3291 has many programmable features and settings that are configured using the Interactive Data Sheet (IDS). This document only describes the functions and settings of the wireless related parameters which are located in the following tabs of the IDS user interface.

- Setting tab: Main wireless parameter settings
- Memory specific tabs:
  - Front end tab: Wireless front-end mode settings specifically, binaural telecoil and mic plus binaural telecoil.

- Wireless tab: Streaming enable and stereo and phone mode wireless audio level and microphone mixing levels.

Setting Tab Wireless Parameters

The Settings tab is the first tab that is displayed when IDS is launched (see Figure 2). The primary wireless settings are located on this page.

Figure 2. IDS Settings Tab

All of the wireless parameters (see Figure 3) on the settings tab are grouped in the lower right part of the screen.

Figure 3. IDS Settings Tab Wireless Parameters

The following parameters can be configured on the IDS settings tab.

- **DeviceID:** Device Identification (left/right). This control identifies the hearing aid as a left or a right device. This is important as a hearing aid or relay device uses this information to determine which hearing aids are present. One hearing aid in a binaural system must be programmed as left and the other hearing aid in the system must be programmed as right.

- **MSSynch:** Memory Select Synchronization (enabled/disabled). When enabled, it will allow a hearing aid to send MS position information to the other hearing aid. If this parameter is enabled, the hearing aid will respond by changing its local MS position (A, B, C, D, E, F) and then transmitting its own MS position to the other hearing aid.

  To configure both hearing aids in the system to transmit their MS position to the far ear, both hearing aids must have MSSynch set to enabled. If MSSynch is disabled, when a MS is initiated, it will only change the memory position on the local hearing aid; it will not transmit its MS position to the far ear.

- **VCSynch:** Volume Control (VC) Synchronization (enabled/disabled). When enabled, it will allow a hearing aid to send VC level information. If this parameter is enabled, the hearing aid will respond by changing its local volume and then transmitting its own VC level to the other hearing aid every time the VC is changed.

- **InterAuralDelay**: Interaural Audio Delay Adjustment (0 to 1 mS). The actual values available depend on the sampling frequency used by the hearing aid. This parameter adjusts the amount of delay that is introduced between the audio in the transmitting ear and the audio in the receiving ear. A small adjustment in this delay

may be required to create a balanced sound in a binaural system.

For a sampling frequency of 16 kHz, a value of 0 to 16 is available, corresponding to a range of 0 to 1 ms in 0.625 mS increments.

For a sampling frequency of 32 kHz, a value of 0 to 32 is available, corresponding to a range of 0 to 1 ms in 0.313 mS increments.

- **TxLevel:** NFMI Transmitter Signal Level Adjustment (4.86 V to 12.76 V). This control allows for the adjustment of the transmitted power of the NFMI transmitter.

  Ayre SA3291 is pre−configured for optimum transmission power at the default value, however some increase or decrease in Tx power may be desired in certain situations. Increasing the Tx power will increase the wireless operating range but will also cause an increase in power consumption which will shorten the battery life of the hearing aid.

- **VendorID:** Vendor Identification Number (0 to 255). This is a unique manufacturer's identification number that is assigned by ON Semiconductor to each customer. This ID ensures that hearing aids from different manufacturers do not interfere with each other when in close proximity.

  The VendorID available for configuration in a remote control is equivalent to the Manufacturer's ID that is used to uniquely identify a manufacturer's hearing aid. The Manufacturer ID that has been assigned by ON Semiconductor for your hearing aids can also be used as your Vendor ID for the remote control, if desired.

- **NetworkID:** Network Identification Number (valid entry: 0 to 65536). This ID number corresponds to the serial number of an optional remote control, and is used to assist with the identification between a remote control and the hearing aids.

  If a remote control device is not available at the time of programming, a value of '1' should be entered in this field.

  There is a special value that can be programmed into this location to allow the remote control to be able to communicate with the hearing aid. Entering a value of '65536' will allow the hearing aid to always be able to receive commands from any remote control that has been programmed with the same Vendor ID.

- **LowPowerDelay:** Timeout value for no wireless audio. This value determines how long the receiver will wait for wireless audio to resume before going into a low power mode.

  This time out can be a value between 5 seconds and 65 seconds, with a 5 second step size.

Memory Select Tab Wireless Parameters

Each of the MS tabs arranged vertically along the left side of the IDS screen have additional tabs available for parameter programming as shown in Figure 4.
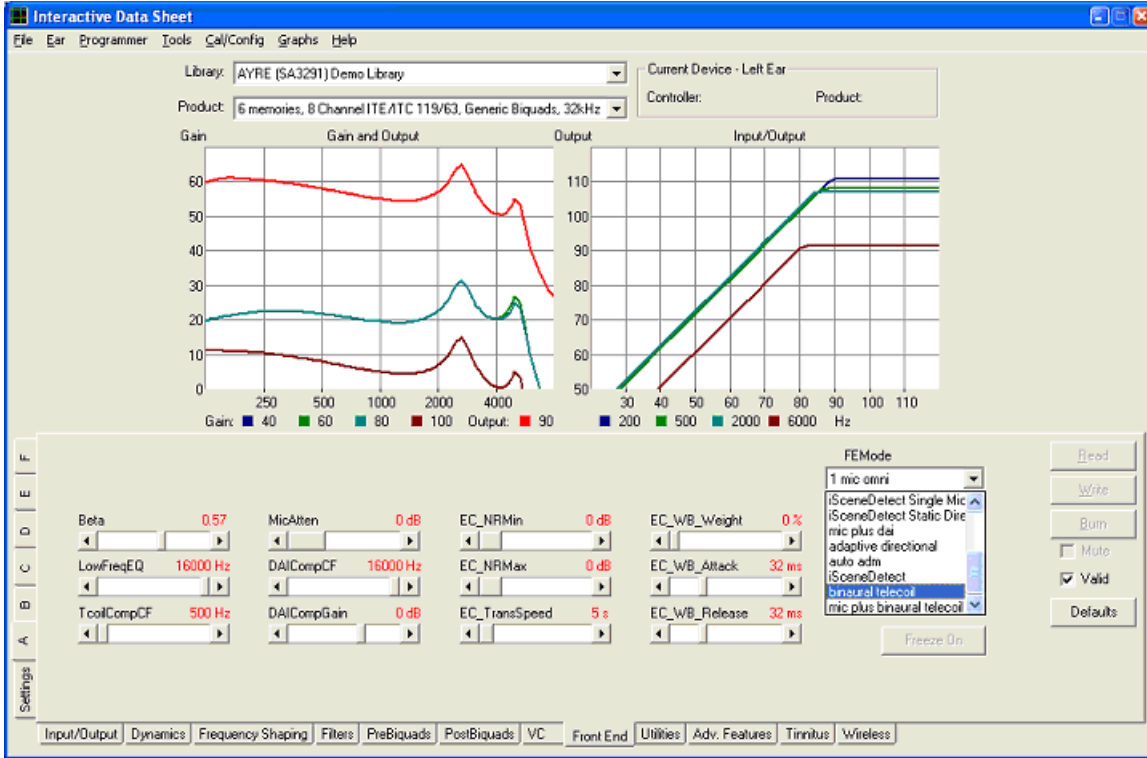

Figure 4. Memory Select A FrontEnd Tab

The front end tab in each of the MS A-D tabs contains controls which are used to select the inputs connected to the hearing aid, and to adjust the settings of the inputs.

The FEMode control is used to select the input, and contains two choices for wireless inputs at the bottom of the pick list (see Figure 5).
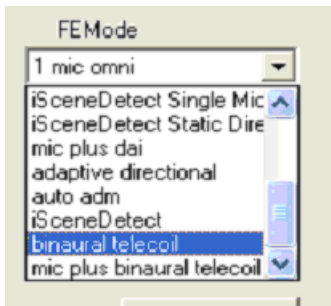

Figure 5. Front End Mode Wireless Settings

Binaural Telecoil

Ayre SA3291 binaural telecoil mode provides two-ear telephone listening. In this mode, the user can adjust the VC on the ear opposite of where the telephone is being used. If the hearing aids are out of range for longer than the programmable low power delay setting (see section "Setting Tab Wireless Parameters - LowPowerDelay"), the hearing aid will return to the previous non-wireless memory.

NOTE: Streaming by a remote control will disrupt the binaural telecoil audio link until the streaming ceases. For this reason, IDS will restrict users from enabling wireless streaming when the hearing aid is configured for binaural telecoil. It is also important to note here that in binaural telecoil mode, both ears will ignore MS commands sent from the remote control.

Software Configuration Requirements

- MS Synch must be enabled on the ear configured for binaural telecoil.
- When using an auto-telecoil (i.e. reed switch), binaural telecoil must be configured in Memory D and DOnly must be set to enabled on the Settings tab in IDS. (D Only mode is reserved for binaural telecoil. This mode cannot be used with any other front-end mode.)
- In order to be able to change the VC level from the far ear, VC Synch must be enabled on this hearing aid.
- Inter-aural delay should be adjusted to achieve optimal sound localization.

- If both left and right ears are equipped with both telecoils and reed switches (or equivalent), then the user can move the telephone from one ear to the other and the system will automatically switch the audio signals and adjust the inter-aural signal delays. The phone switch must be completed within the programmed auto-telecoil debounce time for the switch to happen seamlessly. The Tcoil debounce time can be configured on the Setting tab in IDS.

Mic plus Binaural Telecoil

Ayre SA3291 Mic plus Binaural Telecoil mode provides two-ear telephone listening plus external audio mixed together. In this mode, the user can adjust the VC on the ear opposite of where the telephone is being used. As above, if the hearing aids are out of range for longer than the programmable low power delay setting (see section "Setting Tab Wireless Parameters – LowPowerDelay"), the device will return to the previous non-wireless memory.

NOTE: Streaming by a remote control will disrupt the mic plus binaural telecoil audio link until the streaming ceases. For this reason, IDS will restrict users from enabling wireless streaming when the hearing aid is configured for mic plus binaural telecoil.

Software Configuration Requirements

Refer to Binaural Telecoil section.

NOTE: There is one additional parameter on the Front End tab called *MicAtten*. This parameter allows the user to adjust the attenuation of the microphone signal.

Wireless Audio Streaming

Ayre SA3291 is capable of receiving wireless audio signals and remote control commands streamed from a remote transmitter.

To enable streaming, each hearing aid must be configured as left or right, and the **Streaming Enable** checkbox should be selected in the IDS wireless settings tab (see Figure 6).
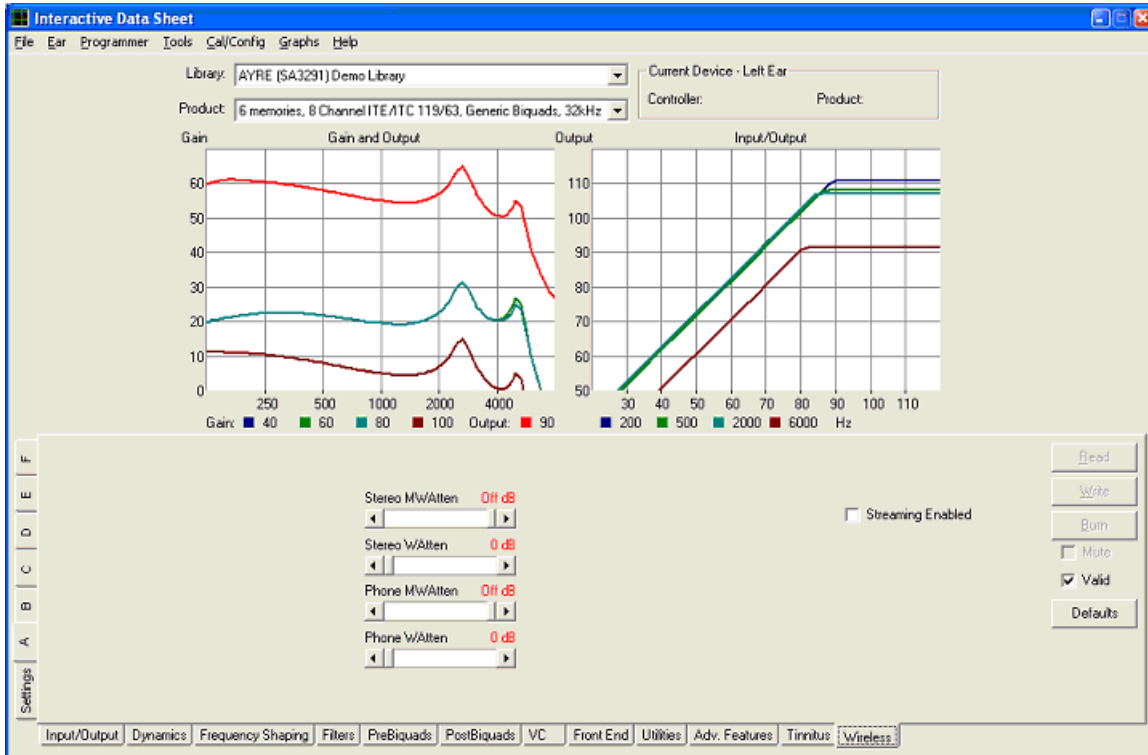

Figure 6. Memory Select A Wireless Tab

All front-end modes with the exception of *binaural telecoil* and *mic plus binaural telecoil* can be used with wireless streaming.

The sliders to the left of the **Streaming Enabled** checkbox allow the relative volume levels of the local mic and the wireless signal to be adjusted.
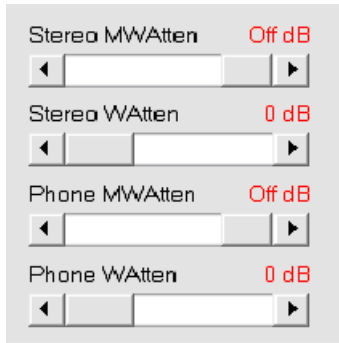
Figure 7. Wireless Tab Audio Level Settings

These sliders are arranged in two groups of two sliders each (see Figure 7), and allow the relative mixing of the wireless signal and the local microphone for two different types of wireless signal: Bluetooth® telephone and Stereo Audio.

By providing separate volume adjustments for wireless phone and wireless stereo inputs, the volume of the phone signal can me mixed at a different level than a wireless stereo signal.

StereoMWAtten / Stereo Watten Sliders
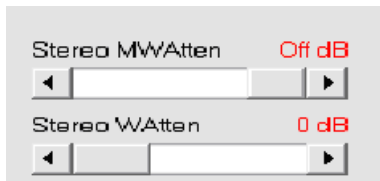
Figure 8. Wireless Tab Stereo Audio Level Settings

These two sliders (see Figure 8) adjust the relative amplitude of the local microphone and the incoming wireless streaming signal when the streaming signal is a Stereo Audio source such as a MP3 player.
- **StereoMWAtten**: Adjusts the attenuation of the local microphone from 0 dB to -24 dB and off when the streaming signal is Stereo Audio.
- **StereoWAtten**: Adjusts the attenuation of the streaming audio from 0 dB to -24 dB when the streaming signal is Stereo Audio.

PhoneMWAtten / Phone WAtten
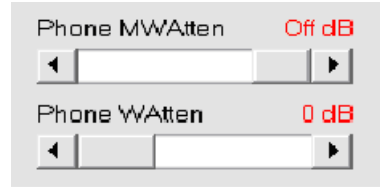
Figure 9. Wireless Tab Phone Audio Level Settings

These two sliders (see Figure 9) adjust the relative amplitude of the local microphone and the incoming wireless streaming signal when the streaming signal is a phone source such as a Bluetooth cell phone.
- **Phone MWAtten**: Adjusts the attenuation of the local microphone from 0 dB to -24 dB and off when the streaming signal is a phone source.
- **Phone WAtten**: Adjusts the attenuation of the phone source from 0 dB to -24 dB when the streaming signal is a phone source.
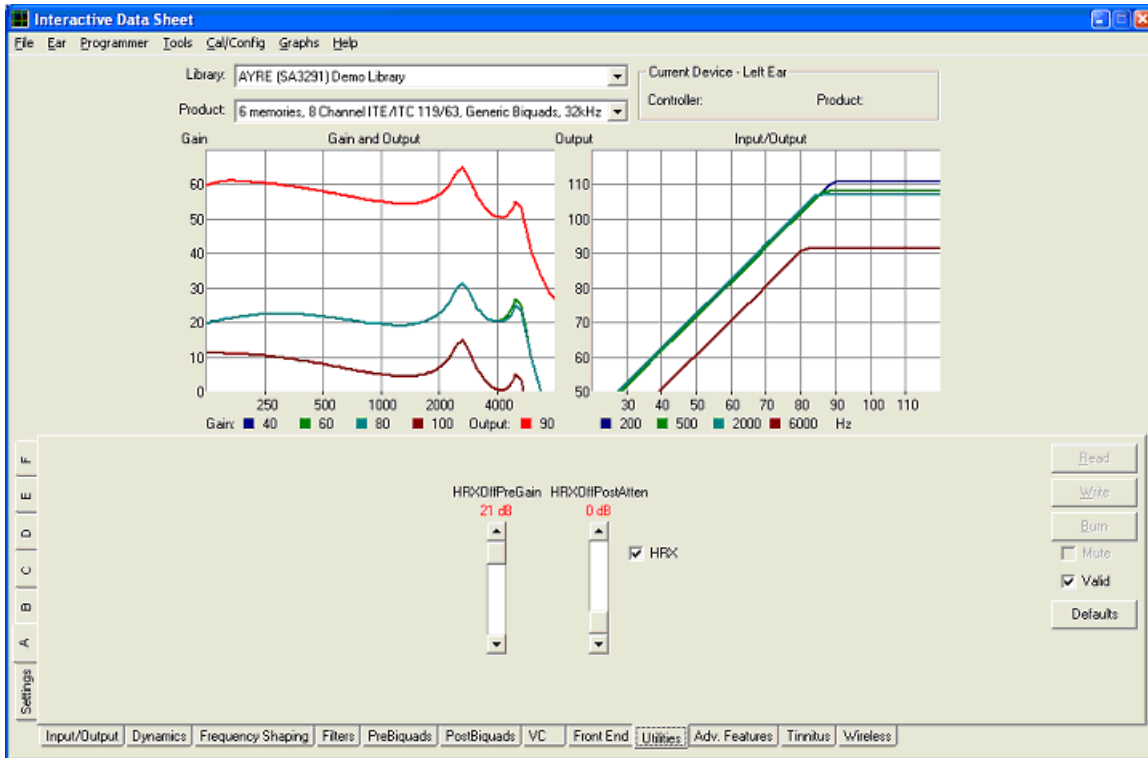
Stereo Streaming Gain Distribution

Figure 10. Memory Select A Utilities Tab

When HRX is disabled on Ayre SA3291 device, the gain on the front-end of the system can be adjusted using the HRXPreGain and HRXPostAtten parameters (see Figure 10) in combination with the Wideband Gain parameter to get the desired gain distribution.

Please note that HRXPreGain and HRXPostAtten are provided to give control over the preamplifier gain settings when HRX is enabled. Normally the default values should be used.

Ayre SA3291 Wireless System Consideration

With the configuration of the wireless parameters properly set, the devices will perform as expected under normal operating circumstances.

However, because these devices are based on wireless technology, there are certain situations where the behavior of the devices needs to be anticipated.

Streaming Reception

Streaming audio will continue to be received when the user changes memory selects, unless the MS selected does not have wireless streaming enabled.

Streaming audio will be received until the hearing aid detects that wireless audio has been missing for the length of its timeout value "LowPowerDelay".

If the hearing aid goes out of range of the relay device but comes back into range before the timeout has expired, it will reconnect and resume audio output.

If the hearing aid is turned off while streaming and turned back on, it will not resume streaming until it receives another wireless command to initiate streaming. (This will need to be initiated by the relay device.)

If a relay device is transmitting while binaural telecoil is enabled, it will disrupt the ear-to-ear audio streaming. This cannot be prevented by the hearing aid, so the relay device and hearing aid user must manage this scenario.

Remote Control

Ayre SA3291 can receive wireless remote-control messages from a remote control device.

Remote control functions are supported in all operating modes with the exception of binaural telecoil modes, where MS changes are ignored. This is to prevent a streaming audio source from interrupting a telephone conversation.

The hearing aids will be paired with a remote control at the time of manufacturing or fitting.

It is possible to wirelessly pair the hearing aid with a new remote control in the event that the original device is lost or destroyed.

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