FOCUS enhancements

FS848 HD Wireless Audio Integrated Circuit
"Superior Surround Made Simple"

MyZone™ Technology:
Home Theater Surround Calibration with a Press of a Button

Focus Enhancements, Inc.

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This paper describes the features and benefits of the MyZone technology included in the FS848 HD Wireless Audio Integrated Circuit (IC) designed for audio Home Theater applications.

Disclaimer

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Overview

The FS848 Wireless Audio IC is a premium audio solution designed specifically for Home Theater audio systems. The FS848 was designed to solve Home Theater audio setup and distribution difficulties by delivering innovative features and capabilities in three key areas:

- **High Quality Audio:** Extracts the highest audio fidelity possible from the speaker drivers and cabinets through programmable filters and crossovers tuneable to each speaker's characteristics.
- **Ease of Setup:** Automatic Home Theater audio setup and single button audio sweet spot location programming.
- **Robust Wireless Network:** Provides a noise free, interference resistant wireless network between the master and up to eight speakers, with 2 ms latency.

This white paper focuses on the MyZone technology integrated into the FS848, which is one of several features enabled by Focus Enhancements that greatly simplify the Setup process of a Home Theater System.

This white paper builds on the SpeakerFinder™ technology described in a separate white paper. It is recommended that you read the SpeakerFinder whitepaper prior to reading this document. Please refer to the complete set of white papers about the FS848 HD Wireless Audio IC solution.

Technical Challenge

One challenge faced by Home Theater consumers, once they've installed and wired their speakers, is calibrating each of the speaker's channels for volume and phase delay for the desired listening location. The volume adjustment is crucial for ensuring that the volume level from each speaker is the same at the listener's position. The phase delay is critical to ensure that the sound from each speaker arrives to a listening position at the desired precise moment. For instance, if the surround speakers are 15 feet further away from the listener than the front speakers, approximately 13 ms of delay should be added to the front speakers.

With "value" class Home Theater systems, surround calibration might not even be possible, or might be simply limited to setting the relative volume of each speaker by ear or with an aftermarket sound meter. Obviously this is a very rudimentary and cumbersome calibration at best.

With “mid-range” Home Theater systems a microphone is sometimes included to automatically calibrate the volume level of each speaker in a calibration mode. This calibration technique typically requires placing the microphone in one or more positions throughout the room. The volume calibration method is moderately accurate (within 2 – 3 feet), although time consuming, noisy, and inconvenient. A few systems also support the ability to program the delay from each speaker such that sound arrives at the listening position at the same time. The calibration typically requires accurate measurement of distance from the listening location to each speaker. The delay for each speaker is calculated by hand using an algebraic formula and then entered into the Home Theater system via the remote or the front panel. Obviously this is a complicated, time consuming process for the majority of consumers.

With “hi-end” Home Theater systems, volume calibration with a wired, hand-held microphone used at multiple locations within the room is typically standard. The most advanced systems also automatically calibrate the delay for each speaker such that the sound from each speaker arrives at the listening location simultaneously. Each time the user wishes to move the listening position, the lengthy calibration process must be repeated. These systems are often made for the custom installation market, requiring visits by an installation professional and the use of custom, expensive gear.

FS848 MyZone™ Solution

The FS848 MyZone functionality builds on top of SpeakerFinder to incorporate the listener's actual position in the room mapping process. With SpeakerFinder, the listener's position is assumed to be in the center of the surround speaker network based on a mathematical formula of the speaker positions located by ultrasonic tranducers in each speaker.

With MyZone, an additional ultrasonic transducer is added to the system remote control. The listener initiates the MyZone calibration by holding the remote control at ear height and pushing the MyZone button at the desired listening location. The ultrasonic transducer in the remote "chirps", and all of the transducers in the speaker network listen and report back to the master the exact time they heard the chirp. The master uses this data to calculate the listener's position in X,Y space relative to the center speaker to within ±1 cm. The listener's actual position is then stored and updates the previously stored location in the room mapping equation. The system is auto-calibrated to the MyZone location upon each subsequent power up until a new MyZone location is set.

Figure 1: Ultrasonic Transducer

If a speaker is subsequently moved after setting MyZone, the volume and phase for the speaker network is again automatically recalibrated to center the sweetspot on the programmed MyZone location.

The coordinates of the MyZone location are used to calibrate the correct audio delay for each speaker in the room such that the sound from each speaker arrives simultaneously at the listener's MyZone location. This is done by the master instructing each slave module to delay the audio to the correct amount. The amount of delay is very precise and is definable down to individual samples.

Alternatively, in higher end audio video receivers, which include sophisticated audio decoders, the speaker location information can be sent from the FS848 to the audio decoder DSP to provide the volume and delay adjustments based on its own algorithms.

The FS848 is capable of adding up to 40 ms delay for each speaker, which is sufficient to compensate for a 30' x 30' space. This delay capability is more than sufficient to support even the worst case scenario of a listening position being placed next to a speaker in a corner of a 30' x 30' room.

Unlike competing systems, the entire calibration process is silent, takes less than 1 second, does not require the use of a microphone, and is a very simple and intuitive process to the listener.

The MyZone feature enables a listener the convenience of setting the sweet spot for his favorite recliner to listen to classical music, and then later resetting it instantly to the sofa for family movie night. See Figures 2 and 3.

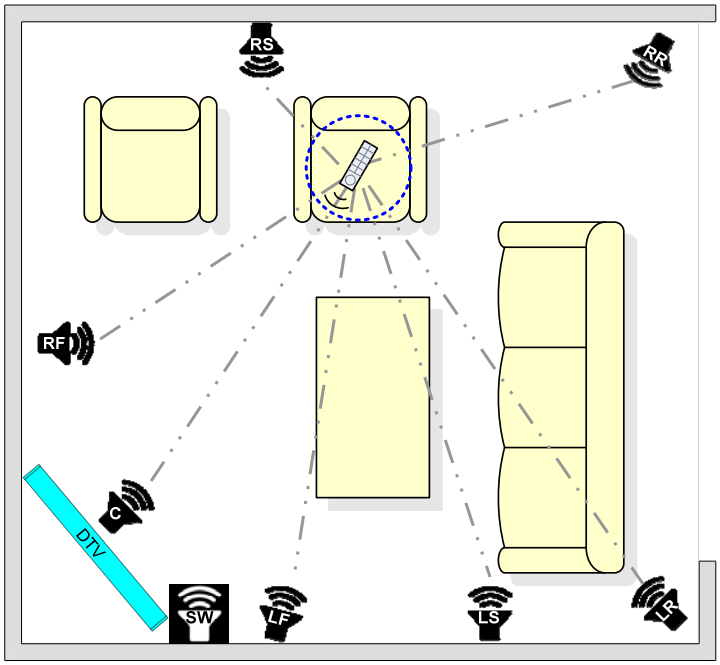

Figure 2: MyZone Mapped to Recliner

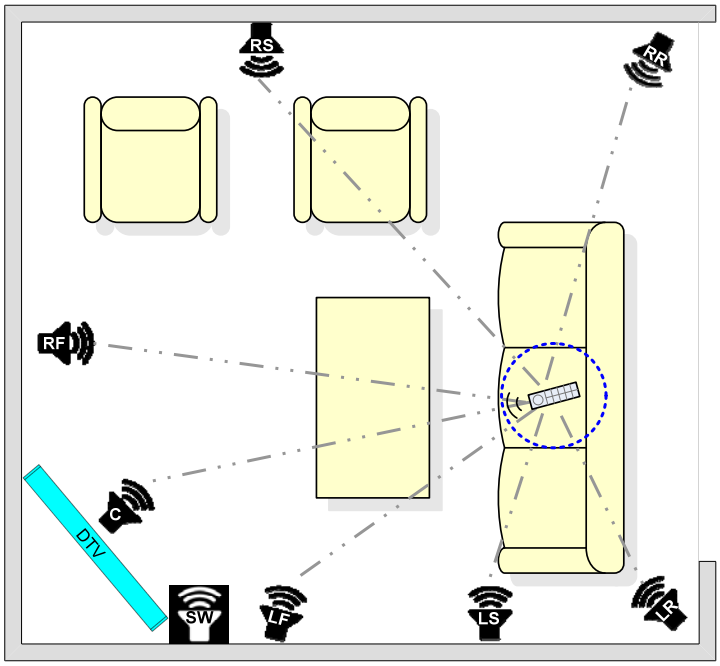

Figure 3: MyZone Mapped to Sofa

Summary

The FS848 Wireless Audio IC is a premium audio solution designed specifically for Home Theater Audio systems to enable an auditory experience exceeding that of comparable wired systems, as well as set a new standard for “ease-of-use” in Home Theater audio.

MyZone is an innovative new technology that enables listeners to instantly and effortlessly calibrate their surround sound sweet spot, with accuracy, and simplicity never before possible.

The MyZone capability is only available on systems based on Focus Enhancement’s FS848 HD Wireless Audio IC. The feature can be easily added at little additional cost or system complexity to an FS848 wireless audio product line. This permits an OEM to easily develop and market a family of products from single platform architecture with different features sets and price points.

FS848 – *“Superior Surround Made Simple”*

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