



Focused on Continued Growth

By David Tovissi

Vice President and General Manager
HARMAN Luxury Audio

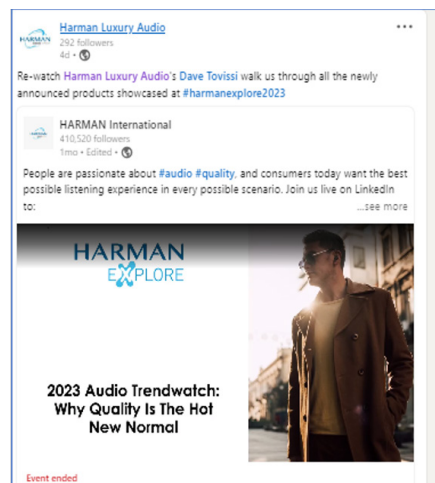
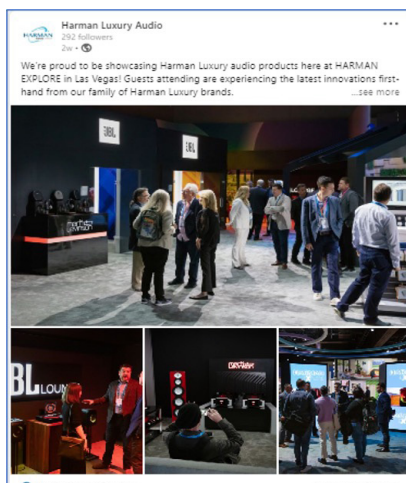


As we kick off the new year with goals and objectives, we need to focus our attention on how to maintain our aggressive growth. As a Business Unit of HARMAN, the Luxury Audio Group has achieved considerable growth over the past several years. Our growth can be attributed to being extremely focused on our goals and objectives. Business goals are abstract ideas that express a desired result. Goals are crucial for strategic planning as they can impact every aspect of one's business, from its finances to its culture. Typically, goals are broad and focused on the long-term success of the company. In other words, they don't include the mechanics of achieving them. Examples of the goals that we have been focused on over the past four years include: Improvements in our Quality, the Timeliness of our products hitting the market and the level of Customer Service. Those goals will remain a major part of this year's mission..

Once an organization establishes its goals, it can then move on to creating objectives to achieve them. Objectives are short-term actions that a business needs to complete to reach a goal. They are more measurable than goals and usually feature a specific aim and timeline. In general, an objective is narrower than a goal and contains details on how the business should accomplish it. For instance, one of our goals in CY23 is to increase awareness of our products and services to our customers. Our objectives to accomplish this goal will be to invest in new marketing strategies.receiving accolades from everyone who has reviewed them.



One of the new marketing strategies we are investing in will include a narrow focus on relevant social media platforms where we believe our customers are following on a consistent cadence. An example of a specific objective associated with this goal is to establish a Harman Luxury Audio LinkedIn site where our internal and external customers can post news and events that are impacting the business.



We welcome our distributors and dealers to follow our Harman Luxury Audio page, invite others to follow or post stories about your business and to include our hashtag #HarmanLuxuryAudio in your post. Our team will also repost articles to our LinkedIn site to amplify your post to others. So, keep us in mind when you want to expand your brand's reach in CY23.



Another CY23 goal for my team will be improving and extending the reach of the HARMAN Luxury Audio University. Last year we added over 612 new learners to our university. This year we want to double that number as well as improve the effectiveness of our curriculum. One of the objectives that we have associated with that goal is to create a virtual version of the renowned Luxury Audio Academy. Previously hosted in Northridge, the academy brought together our dealers and

our engineers to learn from each other. Of course those academies ceased during the pandemic and have been much harder to pull off with the ever increasing demand on our engineers to deliver products on a timely basis. With that being said, we will be using Artificial Intelligence and a little HARMAN pixie dust to capture the highlights of the academy and bundle those highlights into a collection of e-learning courses that everyone can participate in at their leisure.



For those of you who have been fortunate enough to attend an in-person Luxury Audio Academy in the past, I welcome you to provide the team with “must-haves” in the virtual version of the academy. For those wondering if we will be able to engage the learner at the same level of knowledge and experiences as the in-person academies, I encourage you to take these courses once they become available on the university and judge for yourself.



What's New

Integrated Systems Europ
2023 (ISE) Preview

By Jim Garrett

Senior Director, Product Strategy and
Planning HARMAN Luxury Audio



WThe 2023 trade show season is already in full swing, and our Luxury Audio team is preparing our stand and demonstrations as part of the Integrated Systems Europe 2023 trade show, commonly known as ISE. The show is taking place from January 30 thru February 3 in Barcelona, Spain at the Fira Barcelona Gran Via convention center. Our business unit is exhibiting under the listing of JBL Synthesis, and we can be found in booth 2H450 in Hall 2 – the Residential & Smart Building.

As ISE is focused on the custom integration markets, we have designed our experience around our JBL Synthesis immersive audio systems, JBL architectural loudspeakers, and ARCAM audio/video receivers, all intended to showcase the depth of our product offerings for residential systems integration.

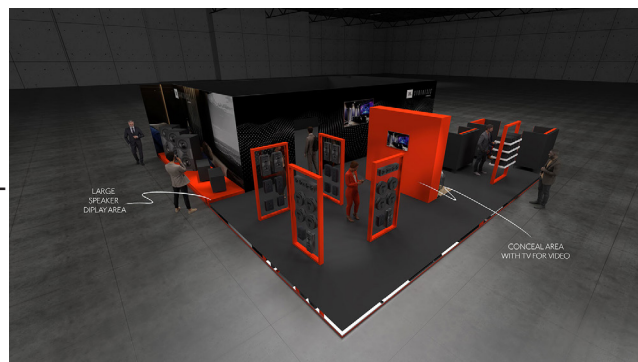
The core of the booth is a JBL Synthesis immersive audio theater featuring two different systems highlighting the scalability of our solutions. The smaller system is based upon the SDR-38 with support from the SDA-2200 and SDA-7120 amplifiers and includes our newest traditional in-wall and in-ceiling loudspeakers such as the SCL-6. The larger system includes our flagship SCL-1 LCR and SSW-1 subwoofer models and is sure to impress attendees with its extraordinary performance. Outside the theater, a selection of JBL Synthesis loudspeakers and electronics will be on display.

The latest architectural loudspeakers from JBL can be found on demonstration at the front of the booth. Our industry-leading JBL Conceal Series invisible loudspeakers including the two-piece C86 loudspeaker and C82W subwoofer will be demonstrated powered by ARCAM electronics, while the new JBL Stage XD-5 and XD-6 indoor/outdoor loudspeakers with IP67 weather-resistance will be demonstrated with ARCAM and Lexicon electronics. Attendees will also see the new JBL Stage 2 in-wall and in-ceiling loudspeakers on display with their advanced acoustic technologies and modern aesthetics.

If you'll be attending the show this year, stop by and see us at the JBL Synthesis booth (2H450 in Hall 2) and we'll be happy to show you how these products can elevate your business with their standout features and unparalleled acoustic performance. For those not attending, stay tuned to our Newsletter for a recap of the show in our February edition.

In addition to these exciting new JBL products, our space includes a JBL Synthesis immersive audio theater room and a Mark Levinson showcase with our award-winning wireless headphones and a reference two-channel system based on our 50th Anniversary ML-50 monaural amplifiers.

If you'll be at our event, I look forward to showing you these products in person. For those not coming to Las Vegas, stay tuned to our Newsletter site for more information on the new products and a recap of the show.



What's New

Luxury Audio Featured in Extensive Media Coverage for HARMAN Explor 2023

Boasting seven new product announcements, Luxury Audio was the shining star at HARMAN Explore 2023. The media coverage was extensive and not only from the usual suspects which speaks to the wide variety of new products shown including the JBL BT Spinner turntable which garnered peak interest and excitement. From Forbes to Popular Science to Wired, check out the long list of publications and the links to the coverage:

[Harman Unveils Beautiful New Retro Audio At CES Featuring Innovative New Technology](#)

[CES 2023: JBL's Classic Series Debuts at HARMAN Explore](#)

[JBL mixes classic hi-fi with modern tech at CES 2023 – and pumps up its Dolby Atmos soundbar power - Beautiful retro hi-fi design with the latest digital tech](#)

[Harman says its new JBL wireless turntable doesn't skimp on audio quality](#)

[The coolest new tech and gadgets from CES 2023 Day 1](#)

[The Best Speakers, Headphones & Audio Gear of CES 2023](#)

[Harman Highlights Performance with a Retro Twist](#)

[Harman Debuts New JBL Classic Series Integrated Amp, Streaming Media Player, CD Player, and Turntable](#)

[JBL Rocks Two New Retro Turntables for 2023](#)

[JBL's first Bluetooth turntable offers aptX HD wireless streaming at an affordable price](#)

[CES 2023: 100+ Highlights and Oddities From the Show](#)

[CES 2023: HARMAN Debuts JBL L10cs Classic Series Subwoofer](#)

[HARMAN Luxury Audio To Unveil JBL 4329P Studio Monitor Powered Loudspeaker At HARMAN Explore](#)

[CES 2023 News: Harman to Offer JBL TT350 Classic Turntable and Bluetooth-Enabled JBL Spinner BT Turntable in Q2 and Q3 2023, Respectively](#)

In addition to the great coverage, HARMAN Luxury Audio products also won some prestigious awards:

AVS Forum Best of CES 2023

- JBL 4329P Studio Monitor
- JBL Classic Series Black Edition Family

Sound & Vision Editor's Pick at CES

- JBL Spinner BT Turntable
- JBL 4329P Studio Monitor

What Hi-Fi? Stars of CES 2023

- JBL TT350 Classic Turntable
- JBL 4329P Studio Monitor

TWICE Picks Award Winner

- JBL Spinner BT Turntable

AVS FORUM



SOUND
& VISION



Training Tips

Training Module Updates January 2023

By Kevin Kent



HARMAN University 2022 Recap

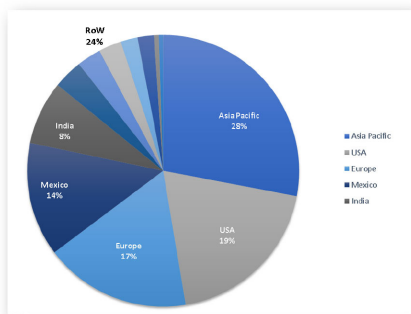
HARMAN University attendance continues to grow, and as we reflect on the learning activities in all of 2022 the number of new users increased by more than 55% and the number of course completions grew by 42% compared to the previous year. Here are some highlights of HARMAN University trends in 2022:

Top three courses:

1. ARCAM AVR5
2. Hi-Res Audio
3. JBL 4305P



Top regions which completed courses in 2022:



The HARMAN University team would like to thank you for taking the courses this year and look forward to providing improved and more comprehensive product training in 2023. We've received your feedback and are working hard to develop new training modules based upon the comments we have received so far. In addition to the course surveys, if you have any special requests for specific training, please send us a note in the "Messages" section on the HARMAN University website.

As always you may access all the training courses by clicking [here](#).

Once you sign in, if these courses are not populated on your home page, click "Go to Courses" to sign up. Stay tuned next month as more training becomes available.

Meet The Team

Meet the HARMAN Luxury Audio Team

Name: **Erik Lundin**

Position/Job Title: **Sr. Mechanical Engineer**

With HARMAN Since 2021



With Meet The HARMAN Luxury Team, our goal is for you to get to know us better. In each edition we feature a different member of the team, and this month it's Erik Lundin, Sr. Mechanical Engineer.

How would you describe what you do in your current role?

I use 3D modelling software to create mechanical designs for our speakers. I also use it to perform simulations in order to improve and verify those designs, and then render pictures of what they will look like.

What did you study in school? Did you always imagine yourself doing something like what you're doing now or did the fates just take you in that direction?

I studied Mechanical Engineering, but my career path has been a winding one. I have worked in software development, music production, as a pilot, and as a teacher, apart from my engineering experience. Ever since I was a kid I've had a strong interest in engineering and science, but if you had asked me 10 years ago if I would be working at HARMAN, I would not have believed you.

How did your career path lead you to HARMAN?

Well it was certainly not a straight line. I have always loved music, and learned a lot about sound building a couple hobbyist music studios as a teenager and into my early 20s. I never really considered that passion very relevant to my engineering work, but when I found myself looking for the next stage of my career in 2020, the stars aligned. I was still working as an Engineering Lead at a company making mostly outdoor antenna systems when I saw an opening at HARMAN and applied.

What is the most important thing you have learned over your career?

I think the most valuable asset a person can have, especially in engineering, is having learned how to learn. People are unique in the ways they learn best, and fastest. I like to say that I am a very experienced learner, having more or less switched careers completely multiple times.

Any other advice you would share with people just starting out in this industry?

Bring your passions with you! The best work environments are diverse and multi-faceted, and every project can benefit from a new take.

What are you most proud of in your life?

My collection of custom vehicles, which are all individual testaments to the incredible talents of my friends and collaborators. Each one tells a little story about a friendship.

When did you realize you had a passion for music or audio? Was there any one band, song, or movie that did it for you?

I was very lucky to be surrounded by music as a child. My parents both played the piano, and our home had a music room with what I considered to be an amazing 80s Hi-Fi system. I ended up playing brass instruments for a few years, but then got sucked into the world of digital music through OctaMED on the Amiga 500.

What current technology impresses you the most?

3D printing. We've gone from wild ideas to general household availability in just a decade, and it still amazes me.

Favorite music genre?

That's going to be a toss-up between 80s new wave stuff and 90s/00s industrial. Don't make me choose.

The desert island question, of course. If you were marooned for eternity and could listen to only three albums, what would they be?

This question is nigh impossible to answer, because one needs to take minutes per album into account!

Nine Inch Nails – The Fragile
Ella Fitzgerald & Louis Armstrong – Cheek To Cheek
Tom Waits – Rain Dogs

You have the floor. In closing, tell us anything else you want us to know about yourself.

I've played classical guitar for 20 years and only know a single normal chord.

Tech Talk

Jitter, Phase Noise, and Reference Clocks

By Dylan Constan-Wahl, Principal Engineer

Whenever we listen to a music recording, we also inherently hear the characteristics of the recording and playback process. Analog recording processes were well known by their particular qualities and limitations, whether it was Edison's wax cylinders, cassette tapes or vinyl LPs. Many of us have experienced the effects of tape hiss, wow and flutter, tracking distortion, and rumble.

Early digital audio processes also exhibited plainly audible limitations like significant transport jitter and error rates. CD audio also had a limited bit depth (16 bits) and a low sample rate (44.1kHz) which meant that the reconstruction filter was extremely difficult to design in an optimal way.

We now live in a remarkable period where the digital audio recording/playback process has the potential to record/reproduce the highest audio dynamic range and timing resolution ever possible. Bit depths up to 32 bits (or floating-point representations beyond this), sample rates up to 768kHz, DSD audio at multiples of the original clock rate are now readily achievable. Modern digital audio presents music artists and listeners with a remarkable medium, on which every musical intention of the artist can be communicated to the listener as if they were present at the recording studio.



At the same time, these high bit depths and sample rates have meant that every element of a piece of audio equipment must be re-evaluated and optimized. Digital to analog conversion, at its heart, means the reproduction of a precise signal level at exactly the correct relative moment in time. Errors in timing and errors in level both show up in the reproduced signal as either noise, harmonic distortion or non-harmonic signal-related distortion.

Reference Clock

The heart of a high-quality digital-to-analog converter is the reference clock. A stable, low noise clock ensures that the DAC chip has a fighting chance of converting samples to the analog domain at precise intervals, ensuring highest fidelity to the recording. In addition, any processes (asynchronous sample rate conversion, oversampling, buffering) designed to filter incoming data jitter depend on the purity of this clock.

How do we characterize the quality of a reference clock? We must first recognize that we can analyze the reference clock both in the time domain and in the frequency domain.

Jitter

In the time domain, imperfections in the reference clock are measured as timing differences between each cycle of this clock and an idealized clock. For purposes of time domain analysis, we can assume the reference clock is a square wave, as shown in figure 1.

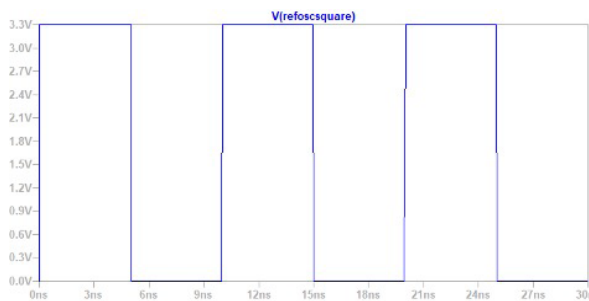


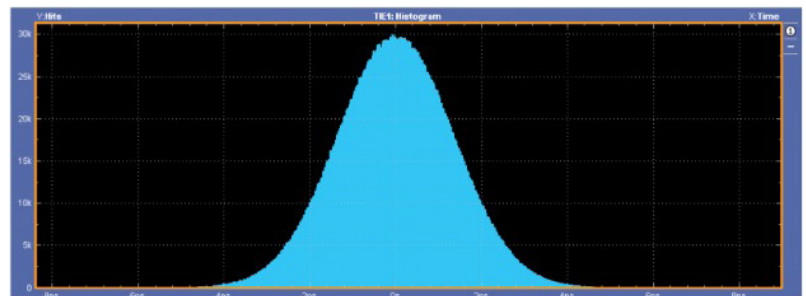
Figure 1- ideal 100MHz square wave clock

We can measure jitter as:

- the total timing error over an interval,
- the error in the length of each cycle of our reference clock,
- or the difference in time between any two adjacent clock periods.

Typically, we use an oscilloscope, which plots signal level versus time, and we capture thousands of clock periods, timed against a near-ideal clock, and plot statistics on the timing error of our reference clock as a histogram, where the mean clock period is in the center of the histogram. The shape of this histogram can hint to us as to whether the jitter present is being generated by a random or non-random process, based on the shape of the histogram. Figure 2 is an example of a histogram of a random jitter from a reference clock.

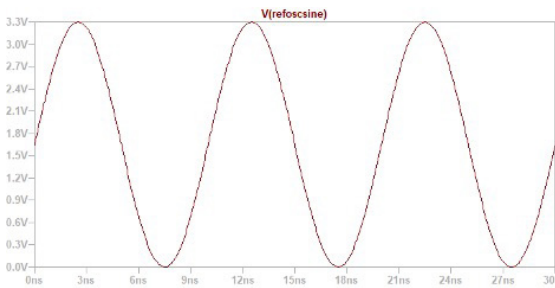
Figure 2 - example of jitter histogram



Phase Noise

Another way to look at reference clock imperfections is in the frequency domain, or a plot of signal level versus frequency. Whether the reference clock output is in fact a sine wave or a square wave, we are most interested in the fundamental frequency. For simplicity, let's assume that the reference clock output is a sine wave. An ideal spectrum of a noiseless sine wave clock is shown in figure 3.

Figure 3 - ideal 100MHz sine wave clock

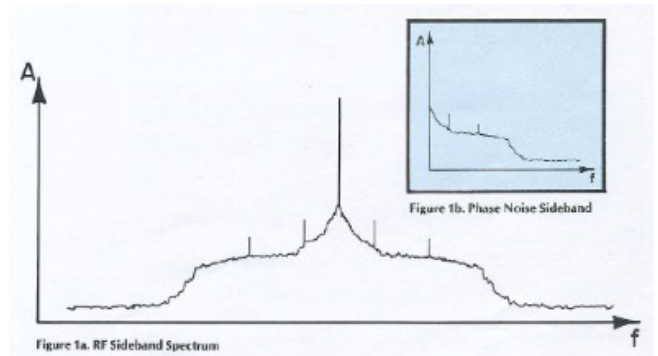


When a clock has jitter in the time domain (variation in its period), in the frequency domain this shows up as phase noise. Phase noise is variation in the phase of a clock signal at some rate(s) determined by the type of noise present.

The frequency spectrum plot of a sine wave with phase noise is symmetrical around the fundamental frequency of the clock, as shown in figure 4.

Figure 4- Symmetrical upper and lower sidebands of an oscillator and selection of the phase noise side-band

Frequencies below the fundamental are considered as the lower sideband, frequencies above the fundamental are the upper sideband. We typically look at the spectrum of the upper sideband alone, as it's easier to understand (the frequencies increase from left to right on the x-axis).



This phase noise plot is extremely helpful for an electrical engineer. In the time domain, we only know the total amount of jitter present and a histogram that hints at whether the jittering process is random or not. The phase noise frequency plot identifies the noise in the modulation of our reference clock at each frequency, allowing us to hunt out root causes. For example, a spike of noise at a specific frequency may occur due to interference with the harmonic of another clock or data line in the system. Low frequency phase noise (random walk FM) is typically due to mechanical vibration or temperature variation. Figure 5 outlines the phase modulation frequency ranges associated with different types of noise source in a clock oscillator.

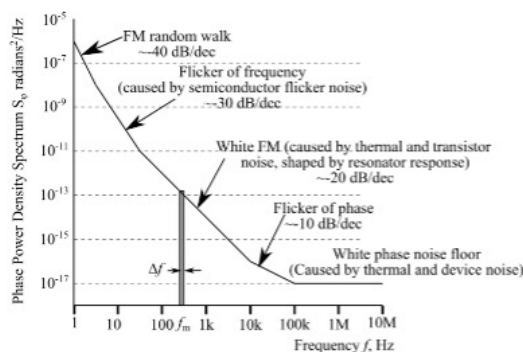


Figure 5 - phase noise frequency ranges and causes
This is helpful in determining what is causing a particular phase error.

How does this all work out in practice? I was evaluating the performance of two different reference clock oscillators for use with a digital-to-analog converter circuit. Both had a fundamental frequency of around 75MHz, and the time domain jitter measurements were within 20%. When I tried locking to some higher bit rate audio

using this new oscillator, I experienced audio dropouts and unusual sounding distortion.

To investigate, I used a spectrum analyzer with a high impedance active differential probe to observe the phase noise of my previous reference clock and this new clock under test. Figure 6 shows a phase noise plot of the new reference clock under evaluation, and figure 7 shows the phase noise of the previous reference clock.

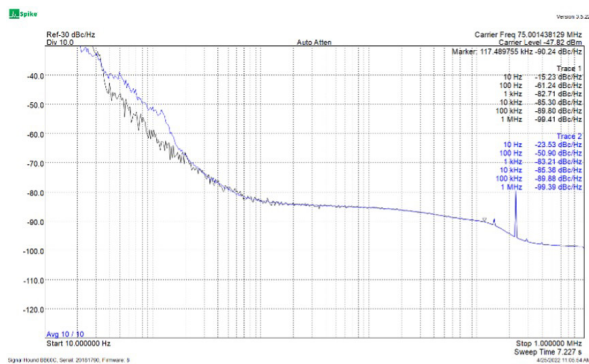
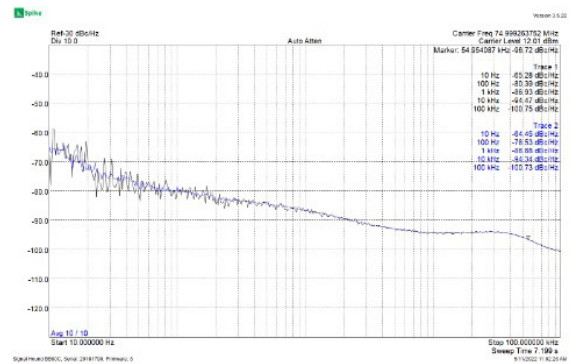


Figure 6 - Phase noise plot of unusable reference clock

Figure 7 - phase noise plot of acceptable reference clock



The blue plot in the figures represents an average of 10 phase noise measurements, the black trace is the last phase noise measurement.

As you can see, the evaluated clock had much higher random walk FM phase noise and semiconductor flicker noise than my original reference.

Conclusion

Modern, high bit rate, high sample rate digital audio formats allow us to hear music recordings with an astounding level of fidelity, but also present unique technical challenges for the designers of audio hardware.

By paying close attention to reference clock jitter and phase noise, we can hear closer to the artist's intended performance than ever before.

Training Tips

Coming Up in February

By James Todd, Senior Global Product Line Manager

Coming Up in February

At HARMAN Explore for CES 2023 in January, Harman Luxury Audio introduced many exciting products including a whole range of JBL Classic Hi-Fi components. The JBL SA550 Classic integrated amplifier, JBL CD350 Classic CD Player and JBL MP350 Classic streamer will all be the focus of a module coming in February which will give a complete run down of all features and benefits.

Later in February we have another new module coming with a focus on Class G amplification. There will be comparisons with other types of amplifiers with a look at what the benefits are at home. This module will give you confidence to talk about Class G to customers concisely.

The HARMAN University team would like to thank you for taking the courses this year and look for-

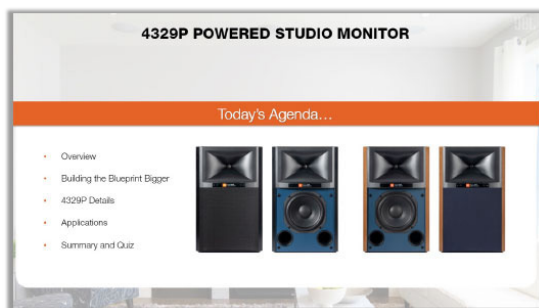


ward to providing improved and more comprehensive product training in 2023. We've received your feedback and are working hard to develop new training modules based upon the comments we have received so far. In addition to the course surveys, if you have any special requests for specific training, please send us a note in the "Messages" section on the HARMAN University website.

Training Tips

JBL 4329P Studio Monitor Powered Loudspeaker System Going Live This Month!

By Matt Dever, Senior Global Product Line Manager



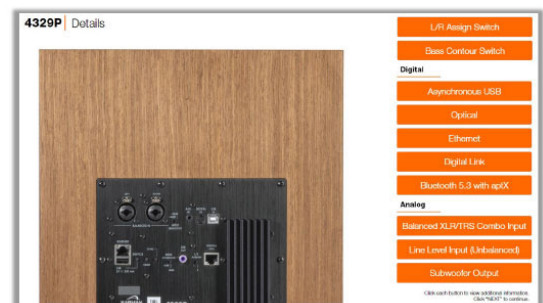
At the HARMAN Explore / CES 2023 event held in Las Vegas, NV earlier this month, HARMAN Luxury Audio introduced the world to the JBL 4329P Studio Monitor Loudspeaker System. The 4329P introduction comes one year after the introduction of the award-winning 4305P Studio Monitor – the smallest and first powered model in the studio monitor family range.

The 4329P takes listening to the next level with its step-up compression driver, larger 8-inch woofer, and twice the amplifier power versus its smaller sibling. The integrated streaming engine provides both wired and wireless network audio capabilities via built-in Google Chromecast, Apple AirPlay 2 and Bluetooth 5.3 aptX Adaptive audio. A 24-bit/192kHz high-resolution DAC ensures music comes across with the highest fidelity, while MQA technology enables playback of MQA audio files with the sound of the original master recording. And for those with extensive digital music libraries, the 4329P will be certified as a Roon-ready product.

In addition to premium wireless audio, the 4329P provides extensive connections for analog and digital physical sources, including USB-B, optical (TOSLINK), and a 3.5mm stereo input. Also included is a professional-grade combination XLR / ¼-inch TRS input for use with balanced or unbalanced signals.

The training will highlight how the 4329P fits into the overall studio monitor family, how it compares to the 4305P and specific details of what allows the 4329P to perform at the high level that it achieves. It will also touch on key applications intended for the 4329P to assist in your overall understanding of this speaker system.

Watch for the release of the learning module on Harman University and then join us in learning about the JBL 4329P, a speaker system that rivals the performance of much larger and far more expensive passive loudspeakers and does so without the added complexity of out-board components.



Dealer Profile

A&B TV

By Jeff Webb, Mike Webb

How long have you been in business?

We have been in business for 56 years.

How many locations do you have?

We have one location in Austin, Texas.

How did A&B TV get its start?

A&B TV started as a service company and was quickly overwhelmed by customers wanting to purchase their replacement TVs and Stereos from us. We have since transitioned from a service-based organization to a Mid-to High-End Home Electronics retailer, offering system design and custom installation of anything we sell.

How many people are on the A&B TV team?

We have 10 people on our A&B TV team.

Thoughts on the importance of training?

We heavily invest in training at all levels for our employees and even make it mandatory for anyone in sales to work in the field, as an Assistant Technician, to have a better understanding of the installation of the products they will be selling.

What do you like most about HARMAN Luxury Audio products and which lines do you feature?

We believe that HARMAN products are best-in-class performance, and we support the Revel, JBL, ARCAM and Mark Levinson lines of HARMAN products.

How do you think the luxury audio industry is currently doing?

Luxury audio is our fastest growing category, and we love supporting luxury lines that understand limited distribution and profitability.

What is A&B TV's mission?

A&B TV's mission is to offer best-in-class products, treat our customers the way we would want to be treated, with respect, honesty and being knowledgeable about the products we sell.

You have the floor. Anything else you want to share with us about A&B TV that you would like the world to know?

A&B TV strives every day to offer, display and sell cutting edge audio/video products that many people seek to visualize and audition before they make their final purchase. A&B TV also spends countless hours to make sure the products in our showroom exceed a customer's expectations and are offered in a relaxed atmosphere. There's a good reason that we have excelled in our business for over 56 years and that's hard work, great customer service and a passion for what we do.

