Episode Book

EPISODE #5720

Active, Passive, and the Speaker That Lied to Daniel

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SYNOPSIS

Daniel rented a Behringer PK110A, the gig went fine, and he walked away more confused than before. Was it a passive speaker? Why do standalone amplifiers exist? And what do mic level and line level actually mean? This episode unpacks the terminology mess behind audio gear — why the PK110A is sold as "active" but may not be active in the strict engineering sense, how damping factor and power distribution quietly favor active designs, and why separates still win on flexibility, repairability, and longevity. Plus the busker question: when you see someone on the street with a mic and an instrument both plugged into one box, what are you actually looking at?

TRANSCRIPT



Corn

There's a specific kind of embarrassment that only audio gear can produce. You rent a box, it works perfectly, the event goes fine, and you walk away knowing less than when you started.



Herman

Which is the opposite of how most rentals go.



Corn

Daniel rented a Behringer PK110A for an event. Got the job done. And then wrote in saying he'd come away more confused about the terminology than he went in. His words. He calls it a passive speaker. He wants to know what specifically makes a speaker passive. He wants to know why standalone amplifiers exist at all, and whether separating components gets you more power. Then mic level and line level, what they actually mean and how they change what gear you need. And finally, the busker question, which I love, which is: if you see someone on the street with a microphone and an instrument both wired into one box that's making sound, are you looking at an amp, a speaker, or both?



Herman

That last one is the whole episode in one image.



Corn

It is. So let's start with the box Daniel actually rented. Because it turns out the receipt is lying to him.



Herman

Not the receipt. The receipt's fine. The label he's put on it is wrong.



Corn

Walk us through it.



Herman

The Behringer PK110A is sold, everywhere, as an active speaker. Behringer's own product page calls it "Active 320-Watt 10-inch PA Speaker System with Built-in Media Player, Bluetooth Receiver and Integrated Mixer." Sweetwater says the same thing. Thomann, Musician's Friend, Walmart, all of them, active or powered. It is not a passive speaker. It has never been a passive speaker.



Corn

So Daniel's wrong.



Herman

Daniel's wrong, and Daniel's wrong in exactly the way the entire industry wants him to be wrong, which is the interesting part. This isn't a guy who didn't read the manual. This is a guy who did the job and still came away with the wrong noun, because the nouns don't mean anything stable.



Corn

Give me the tell. If I'm holding this box, what on the back panel would have told him?



Herman

The speakON output. The PK110A has a speakON output described as being for powering passive speakers. Think about what that sentence requires. To power a passive speaker, you have to have an amplifier. The only place that amplifier can be is inside the box you're holding. So the moment you see an output whose job is to drive somebody else's passive speaker, you know the box in your hands is not passive.



Corn

The box is announcing what it is by what it can do to other boxes.



Herman

And it also has a built-in two-channel mixer with individual mic and line inputs, an XLR and quarter-inch combo jack, RCA, 3.5 millimeter, USB, SD, Bluetooth, and a Class-AB power amp. That's not a speaker. That's a small PA system that happens to have a speaker bolted to the front of it.



Corn

There's something funny about the wattage being 320 on Behringer's page and 350 on some retailers.



Herman

That's just marketing math. A1 Sound lists it as 160 watts RMS and 320 peak, which is probably the honest version. Ten-inch woofer, one-inch compression driver, twenty hertz to twenty kilohertz claimed, ninety dB max SPL, eight point nine kilos.



Corn

Twenty hertz from a ten-inch woofer in a plastic box is a beautiful claim.



Herman

It's aspirational. Anyway.



Corn

So if the PK110A isn't passive, what actually makes a speaker passive? And why would anyone choose one over the active box?



Herman

Passive speaker: no amplifier inside. Full stop. You need an external amplifier or receiver to drive it, and you connect it with speaker wire. That's the classic hi-fi speaker, the bookshelf pair, the tower in your living room. It sits there doing nothing until something else pushes current through it.



Corn

And active means the amplifier lives inside.



Herman

In consumer and marketing language, yes. Powered and active get used interchangeably. You plug it into mains power, you feed it a signal, sound comes out. Sonos, How-To Geek, Fluance, they all treat the two words as synonyms, and honestly for ninety percent of buying decisions that's fine.



Corn

You said consumer and marketing language. Which implies there's a stricter definition somewhere.



Herman

There is, and this is the part I actually want to spend time on, because it's the part that almost every explanation skips. There's a piece from Hifiverse this year that argues the real dividing line isn't built-in amplification at all. It's where the crossover sits.



Corn

Define crossover for people who've never opened a speaker.



Herman

A crossover is a filter that splits the incoming signal into bands and sends each band to the driver that can reproduce it. Bass to the woofer, treble to the tweeter. In a passive speaker, that filter sits after the amplifier. It's made of inductors, capacitors and resistors,



Herman (continued)

and it's working on the full amplified signal, at high voltage, high current.



Corn

So the amplifier is doing all the work, and then the signal gets carved up on the way to the drivers.



Herman

Right. In a active speaker, the filtering happens before amplification, at line level, and then each driver gets its own dedicated amplifier wired straight to the voice coil. No filter between the amp and the driver. The amp and the driver are effectively one unit.



Corn

Which changes what the amplifier is actually doing.



Herman

It changes everything about it. The amplifier is now only ever reproducing one band. It's not trying to push twenty hertz and twenty kilohertz through the same output stage. And the Hifiverse line I keep coming back to is this: "A substantial share of the active loudspeakers on today's market are active on paper only. In reality they are powered speakers with a passive filter."



Corn

So the word active is being used on boxes that aren't active in the strict sense.



Herman

Constantly. Which means a huge number of products sold as active are really powered speakers, meaning they have an amp inside and a passive crossover inside, which is a perfectly fine way to build a speaker. It's just not what the word implies to an engineer.



Corn

Your PK110A is almost certainly in that category. Amplifier inside, passive filter inside, honest box, misleading noun.



Herman

Almost certainly. I can't tell you the crossover topology in that specific model from the spec sheet, and I'd be inventing it if I said otherwise. But the price point and the form factor say powered-with-passive-crossover.



Corn

Okay. So that's the definition fight. Now Daniel's second question, which is the one I think is actually the most interesting. Why do standalone amplifiers exist? His intuition is that when you separate components out, you get more powerful components. Is that right?



Herman

Half right, and the half that's wrong is the half everybody assumes.



Corn

Go.



Herman

Separates give you flexibility and upgradeability and repairability. They don't give you more power. On the engineering, active designs actually win. And they win for reasons that are structural, not incidental.



Corn

Like what.



Herman

Damping factor, first. A passive crossover puts an inductor between the amplifier and the driver. That inductor adds series resistance, and damping factor is essentially the ratio of amplifier output impedance to the impedance of everything in the path. Across a typical filter inductor, damping factor can collapse from something like eight hundred down to about twenty.



Corn

Translate that into what I hear.



Herman

The amplifier's grip on the cone. When the amplifier tells a woofer to stop, damping is what makes it stop, instead of overshooting and ringing and muddying everything around it. Take the amplifier's grip away and the bass gets loose. Not necessarily bad-sounding, but less controlled.



Corn

And the second reason?



Herman

Power distribution. In an active design you can put the watts where they're needed per band. The ATC SCM40A runs a hundred and fifty watts into the bass, sixty into the mid, thirty-two into the treble. That's two hundred and forty-two watts total, but it's not evenly distributed, and it shouldn't be. Bass eats power. Treble doesn't.



Corn

Genelec?



Herman

The 8361A runs seven hundred watts into the bass and a hundred and fifty each into the mid and the tweeter. Nobody builds a passive crossover that intelligently routes power like that, because in a passive design the amplifier has to be broadband. One amp, full range, split afterwards.



Corn

And there's a loss question too.



Herman

A three-way passive filter typically eats somewhere between half a decibel and two decibels. So you're paying for amplifier power and then throwing some of it away in the filter as heat.



Corn

Now give the passive side its due, because you clearly like these things.



Herman

Passive wins on freedom, and the freedom is real. You choose every component of the chain. You pick the amplifier, you pick the speakers, you can insert a separate preamp, a separate power amp, an equalizer, you can swap any one of them without touching the others.



Corn

Repairability.



Herman

If the amp dies, you replace the amp. That's it. In an active speaker, if the amp module dies out of warranty, you're either paying for a proprietary board or you're scrapping a perfectly good driver and cabinet.



Corn

Which connects to the upgrade path.



Herman

Hifiverse makes this point well. A passive system keeps an upgrade path open. Buy decent speakers first, economise on the amplifier, upgrade the amp later when you have the money. The value stays modular. Their line is that selling half an active loudspeaker is not possible. And passive boxes are durable in a way electronics aren't. A well-made passive speaker will give you twenty or thirty years of service. The amplifier attached to an active speaker will not.



Corn

So the answer to Daniel is: separates give you flexibility and longevity, not power. And he's not the only person to assume the opposite, because the intuition that more boxes equals more capability is basically right everywhere else in life.



Herman

It's right about computers. It's right about cameras. It's not right about speakers, because in speakers the integration itself is a benefit.



Corn

Hold on. Say that damping number again.



Herman

Eight hundred to twenty.



Corn

That's not a rounding error. That's a factor of forty.



Herman

It's the single strongest engineering argument for going active, and it's almost invisible from the outside, because you can't see a crossover and you can't hear a spec sheet.



Corn

There's a broader pattern here that I want to name, because it'll come back. Every time you separate components, you gain the freedom to change them, and you lose the benefit of them having been designed together. That's true of speakers, it's true of computers, it's true of everything. Audio just makes it unusually visible.



Herman

Which is also why the whole passive versus active argument never actually resolves. There isn't a winner. There's a set of tradeoffs and a person with a budget.



Corn

Right. Speaker end of the chain is settled. Now what actually goes into that chain.



Herman

Signal levels.



Corn

Which is where I think Daniel's real confusion lives, honestly. More than the passive-active thing. Because levels are the invisible rule that decides whether your gear works or makes an ugly noise.



Herman

There are four levels, and they run weakest to strongest. Mic, instrument, line, speaker.



Corn

Start at the bottom.



Herman

Mic level is the voltage a microphone generates when sound hits it. It's tiny. You're talking a few thousandths of a volt. Practically, mic level gets specified between minus sixty and minus forty dBu. That's the weakest signal in the chain by a wide margin, and it needs a preamplifier to bring it up to something useful.



Corn

And line level is the something useful.



Herman

Line level is approximately one volt. Roughly a thousand times stronger than mic level. And there are two standards living under that one name, which is its own source of misery. Minus ten dBV is the consumer standard, the CD player, the DVD player, the RCA jack on the back of a home receiver. Plus four dBu is the professional standard, mixing desks, preamps, outboard gear.



Corn

Those two aren't the same voltage.



Herman

The gap between them is about eleven point eight decibels. Call it twelve. It's the difference between a signal that's a bit quiet and a signal that's a bit hot, and if you cross the two standards without a pad or a level converter, one of those problems is yours.



Corn

Now instrument level, which sits in the middle and gets skipped by every explanation.



Herman

Instrument level is what comes out of an electric guitar or bass pickup. It's stronger than mic level, weaker than line level, and it needs preamplification to get to line. That's why a guitar doesn't go straight into a mixing desk and sound right. It's the wrong signal for that input.



Corn

And speaker level.



Herman

Speaker level is what comes out of an amplifier. Post-amplification, much higher voltage than line, and it travels on speaker cable, not on a signal cable. It's the end of the line. Nothing downstream of it, because downstream of it is air.



Corn

Now the part that makes this practical. What happens when you get the levels wrong?



Herman

Two failures and they're both instructive. Plug a microphone into a line input and you get almost no sound at all. The input is expecting roughly a thousand times more signal than you're giving it, so it just sits there, barely registering.



Corn

And the reverse.



Herman

Plug a line-level source into a mic input and you get loud and distorted. The preamp is expecting a whisper and you've handed it a shout. It amplifies it to the moon and clips.



Corn

Those two failure modes have completely different symptoms, which is actually useful, because the symptom tells you which mistake you made.



Herman

That's the diagnostic. No sound at all means you're feeding something too weak. Ugly and loud means you're feeding something too strong. And the fix is completely different in each case, which is why knowing the levels saves you an hour of swapping cables.



Corn

Here's where I want to push, though, because I think there's a myth sitting right underneath this. The assumption that the connector tells you the level.



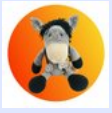
Herman

It doesn't. Not at all. An XLR connector can carry mic level or line level. A quarter-inch jack can carry a guitar signal or a speaker signal. The connector is a physical shape. It's not a promise about voltage.



Corn

So two cables that look identical can be carrying radically different things.



Herman

Radically. And the failure that follows is nasty, because plugging a speaker-level output into an input that expects line level will damage things. The connector matched. The signal didn't.



Corn

One more practical thing before the busker. Gain. How much preamplification are we actually talking about?



Herman

Depends entirely on the microphone. A condenser mic puts out a healthy signal and might only need ten to thirty decibels of gain. A low-output dynamic like a Shure SM7B, or a ribbon mic, can need fifty to seventy. That's the difference between an interface that's fine and an interface that can't do the job, and it's why the same preamp gets called clean by one person and useless by another. They were using different microphones.



Corn

The gear isn't good or bad in the abstract. It's matched or mismatched.



Herman

Which is the whole episode, really. Every question Daniel asked is a version of that.



Corn

All right. Busker.



Herman

Busker.



Corn

Microphone, instrument, both wired into one box. It's making sound. Amp, speaker, or both?



Herman

Both, and a third thing and a fourth thing. When a busker's rig is making sound with a mic and an instrument plugged into it, that box is simultaneously the preamp, the mixer, the amplifier and the speaker. All four stages of the chain, in one enclosure.



Corn

Walk through the internal path, because it's beautiful.



Herman

Vocal mic generates mic level. That goes into a preamp inside the box, which brings it up to line level. The instrument, if it's an acoustic with a pickup, comes in at instrument level and gets preamplified too. Both land at line level inside the mixer section, where they get blended and their levels get balanced against each other. Then that mixed line-level signal goes into the power amplifier, which brings it up to speaker level. And that speaker-level signal drives the drivers, which are built into the same box.



Corn

So the signal hierarchy happens inside one product, in order, and the audience only ever sees the last stage.



Herman

And the tell on stage is the same as the tell on the PK110A. If the box is plugged into nothing but the wall, or nothing at all because it's on a battery, and it's making sound from a microphone, then the amplifier is inside it. There's nowhere else for the amplification to be coming from.



Corn

That's what I love about the busker question. It's the same answer as the PK110A, arrived at from a completely different direction.



Herman

It is the same category of device. The busker box and the PK110A are both all-in-one powered PAs. Just different sizes and different power sources. And that's the reason both of them confuse people, because they collapse four separate components into one object with one name on the front.



Corn

Give us the actual busker gear, since you clearly know it.



Herman

The standard rig is a battery-powered portable PA with at least one mic input and one instrument input, a dynamic vocal mic, an SM58 in most cases, and either an instrument cable or a DI box for an acoustic with a pickup. Fifty to a hundred watts covers most street pitches, because you're not trying to fill a room, you're trying to be heard over a street.



Corn

Named boxes.



Herman

Alto Professional makes one literally called the Busker, two hundred watts, six point five inch woofer, up to twenty-four hours on battery in eco mode. There's a QTX Busker 12, an NUX Busking 200 FR, a Fishman Loudbox Mini Charge. It's a real product category.



Corn

And the reason it's more useful than a guitar amp for busking is that a guitar amp handles one thing.



Herman

A guitar amp is built to make a guitar sound good and it does that job extremely well. It's not designed to take a vocal mic and an instrument and mix them. A battery PA with two channels is, and that's the whole difference.



Corn

Let me put the PK110A and the busker box next to each other, because I think this is the sentence Daniel actually needs.



Herman

Go.



Corn

In both cases, the answer to "is it an amp or a speaker" is that the question has stopped being useful. The box is a chain, and the chain has been collapsed into one object. You're not looking at an amp, and you're not looking at a speaker. You're looking at the whole signal path in a plastic shell.



Herman

And the reason Daniel's rental went smoothly is precisely that the chain was pre-assembled. He didn't have to match anything, because the matching had been done at the factory.



Corn

Which is the same argument as active speakers.



Herman

Same argument, one level up. Integration removes decisions and removes freedom at the same time.



Corn

There's one thing that still nags at me about the crossover point. If most "active" speakers on the market are really powered speakers with passive crossovers, what's the word even doing?



Herman

Marketing. It's doing marketing.



Corn

It's a word that used to mean something specific and now means a box with a plug.



Herman

On the consumer side, yes. And I don't think that reverses, because the incentive runs the other way. Calling something active sounds better than calling it powered. There's no pressure to be precise.



Corn

So the confusion is permanent.



Herman

For the buyer, probably. The engineering distinction doesn't go away, but the words available to describe it have already degraded past the point of being reliable.



Corn

Which is the actual answer to Daniel's whole prompt. The terminology is the problem. The physics is stable and the vocabulary is a mess.



Herman

That's the honest summary.



Hilbert

The speakON out is the tell.



Corn

Say that again.



Hilbert

On the back of that Behringer. If it's got a speakON output on it, there's an amp inside it. That's how you tell. You don't need the spec sheet.



Herman

That's a useful heuristic.



Hilbert

I did sound for a small hall for about six years. Two hundred seat place, Tuesday night lectures, the occasional wedding. We had a pair of passive boxes on stands and one amplifier in a rack, and the amplifier was the thing that failed. Every time. It went in for repair twice in six years, and both times we were dark for a fortnight because there was nothing else to drive the speakers with.



Corn

What did you do in the fortnight?



Hilbert

Borrowed a powered box off a man called Ray. One box, mains lead, microphone straight in. Sounded worse. Worked every single night.



Herman

That's the integration argument in one sentence.



Hilbert

The rack amp was better. I'd still take the rack amp. But when it's Tuesday and there's a hundred and twenty people in the room, "better" is not the question. "Working" is the question.



Corn

How long did it take you to learn that the speakON output meant there was an amp inside?



Hilbert

Long enough. I'd been running that hall for three years before somebody pointed it out. It's not obvious. Nothing on the outside of a box tells you what's inside it.



Herman

That's the whole episode, and he said it in nine words.



Hilbert

The one that got me was the wedding. We had a guitarist turn up with his own amp, plugged the desk into it, and got nothing. He'd plugged a line output into an input that wanted a guitar. Sounded like the PA was broken. It wasn't the PA.



Corn

Wrong level, right connector.



Hilbert

Right connector. Wrong level. That one cost us about forty minutes and a lot of apologising to a bride.



Herman

So the failure pattern with no sound is a level problem, not a broken box.



Hilbert

It's almost always a level problem. The gear is nearly never the thing.



Corn

Hilbert, that's a better answer to Daniel's last question than either of us gave.



Hilbert

It's not complicated. It's just not written on the outside of anything.



Herman

The PK110A tells you what it is if you know to look for the speakON output. The busker box tells you what it is if it's making sound with nothing plugged into it but a microphone. Everything else is on the spec sheet, which is the one place nobody looks.



Hilbert

The spec sheet is where the manufacturer tells you the truth in the least useful possible language.



Corn

I want to sit on that for a second, because it connects to something bigger. If the words on the box are unreliable, and the spec sheet is technically true but practically useless, then the only thing you can actually trust is the topology. What's plugged into what. Where the amplifier sits in the chain.



Herman

Which is knowable. You can always work it out. It just takes longer than reading a label.



Corn

So the practical takeaway isn't a rule, it's a question. Where is the amplifier.



Herman

Where is the amplifier and where does the crossover sit. Those two questions answer every version of Daniel's prompt at once.



Corn

Then let's leave it there, because I think there's a open thing here. If a substantial share of the "active" speakers on the market are powered speakers with passive filters inside, the word active has quietly stopped meaning what it used to mean, and it's not coming back. The industry has no incentive to fix it.



Herman

The buyer's only defence is the back panel.



Corn

And as more of this gear becomes all-in-one and battery-powered, the distinction between amp and speaker and mixer is going to matter less and less to the person using it, while the signal-level hierarchy keeps mattering exactly as much as it always did. That's the asymmetry. The boxes are getting simpler and the rules aren't.



Herman

Someone's still going to plug a line output into a guitar input. That's not a technology problem.



Corn

If you enjoyed this episode, leave a review on your podcast platform of choice. It helps other listeners find the show.



Herman

Thanks as always to our producer, Hilbert Flumingtop.



Corn

This has been My Weird Prompts. Email us at show at my weird prompts dot com.



Herman

We'll be back soon.