

WISDOM AUDIO

FIR Filtering & Linear Phase — What It Is, What It Does, Why It Matters

A Guide for Dealers & Customers

Wisdom Audio loudspeakers are either passive with built in crossover, or active with crossovers in outboard DSP — amplified by the Wisdom DSP amplifiers. The FIR filters live inside those amplifiers, shaping the signal before it ever reaches the speaker. This guide explains what that means, why it matters, and how to talk about it.

1 — What Is FIR Filtering?

FIR (Finite Impulse Response) is a form of digital signal processing. Unlike conventional IIR filtering (Infinite Impulse Response), which can only control frequency response, and will change the phase without being able to control it, FIR controls both frequency and phase — independently.

Phase is timing. It determines when each part of the audio signal arrives at your ears relative to everything else. When timing is off, even a powerful system sounds less focused, less natural, and less involving. When timing is preserved, the system behaves like a single coherent source rather than a collection of separate drivers. This is what's called linear phase performance.



The FIR filters in the Wisdom DSP amplifier correct the signal in the digital domain — before amplification, before the speaker, before the room.

2 — Passive Single-Channel vs. Active Crossover: What FIR Is Doing

Wisdom Audio offers both passive single-channel and active bi-amplified and tri-amplified speaker configurations. The FIR filters in the DSP amplifier work differently in each case — but the goal is the same: make the speaker perform as a precisely engineered system.

Configuration	Passive Single-Channel (Full-Range)	Active Crossover
What it means	One amplifier channel drives all drivers in the speaker via its passive crossover	Separate amp channels drive the tweeter, Mid-bass, and woofer sections independently — no passive crossover between them
FIR role	FIR shapes the full-range signal: phase correction, frequency correction, voicing, and protection all handled in the DSP before the signal reaches the speaker	FIR splits the signal into high and low bands before amplification — each band phase correction, frequency correction, voicing, timed, and levelled independently before reaching its dedicated driver section
Key benefit	Simpler setup, highly optimized. Still dramatically better than a generic amp because the FIR is tuned specifically to that speaker's measured behavior	Maximum control — crossover points, driver timing, and voicing are all handled digitally with no passive components in the signal path. Greater dynamic headroom per driver section
Think of it as	One chef cooking the whole dish, following a precision recipe	Two specialist chefs — one for the sauce, one for the main — working in perfect coordination

In both cases, the passive speaker itself has no active electronics. All the intelligence — the crossover shaping, the time/phase alignment, the voicing — is handled by the DSP amplifier before the signal arrives.

3 — FIR vs. Traditional Crossovers

To understand why this matters, here is what FIR replaces or improves upon.

Traditional / Analog Crossovers	Wisdom Audio FIR (in DSP Amplifier)
X Phase shift at crossover points	✓ Linear phase — timing preserved across the full range
X Drivers misaligned in time	✓ Drivers aligned in both time and amplitude
X Frequency & phase tied together	✓ Independent control of magnitude and phase
X Voicing locked in hardware	✓ Precisely tuned to each speaker's measurement data

The difference isn't just technical — it is audible. The loudspeaker behaves like a single point source rather than a collection of independent drivers. That is what Wisdom Audio means by linear phase performance.

4 — What You Actually Hear

All of this technology has one purpose: making the experience feel more real. Here is what that sounds like.

For Music & Two-Channel	For Surround Sound & Dolby Atmos
✓ Instruments locked in place with precise imaging	✓ Effects placed exactly where the director intended
✓ Transients feel immediate — the snap of a drum, the attack of a piano	✓ Smoother panning — sounds move fluidly with no speaker calls attention to itself
✓ Voices are clearer, more anchored, more natural	✓ Dialogue stays focused across multiple seats
✓ Bass integrates seamlessly — powerful but controlled	✓ Height and surround channels feel consistent with the front stage

5 — How Wisdom Designs the FIR Filters

FIR technology exists in many products — even entry-level AV receivers have it. The difference is not the tool, it is how it is used.

Measure	Over 1,000 data points (up to 3,000) captured around each speaker in anechoic conditions using a Klippel Near-Field Scanner — building a precise 3D acoustic model.
Model	That data becomes a full acoustic 'bubble' — a characterization of exactly how the speaker behaves in space.
Filter	Custom FIR filters are derived for that specific speaker: amplitude, phase, driver timing, crossover points — all shaped digitally in the amplifier.
Listen	Critical listening evaluates tonal balance, imaging, and dynamics — not just measurements.

Most room correction systems measure a few spots and try to fix the result. Wisdom Audio uses FIR to design the solution from scratch. That is a fundamental difference — not a marketing one.

6 — Talking to Customers

Customer asks...	You say...
Why does Wisdom sound different?	Every speaker is measured in over 1000 points in anechoic conditions. The DSP amplifier's FIR filters are then custom-built to that specific speaker — correcting timing, phase, and voicing precisely. Generic amps can't do that.
What is FIR actually doing?	It controls the timing of sound as well as the frequency. When timing is right, everything sounds more focused — voices clearer, bass locked in, the room disappears.
Can I use a different amplifier?	The Wisdom DSP amp is part of the system, not an accessory. The FIR filters are built for that exact speaker and amplifier system. Swapping the amp is like removing the engine management system from a performance car — you lose everything that makes it special.
Is this just clever marketing?	No — it's why Wisdom rebuilt their entire product range around FIR-based active design eight years ago. The shift is a fundamental engineering philosophy, not a feature checkbox.

The Bottom Line — What Every Customer Gets

- ✓ Clearer dialogue, anchored to the screen
- ✓ Precise imaging — every sound in the right place
- ✓ Seamless bass integration — powerful and controlled
- ✓ More convincing Atmos and surround effects
- ✓ A system that sounds like one thing, not many

The result is a system that does more than sound impressive. It sounds coherent, controlled, and convincingly real — the difference between hearing sound and experiencing it the way it was intended.