

Setting Up a Processor

The loudspeaker processor is the brain sitting between your mixer and your amps — get it right and the rig sings, get it wrong and you cook a driver. We walk the whole setup in the order you'd actually do it on site: label the outputs, route them, set your crossover points, line up the subs, clamp down the limiters, open one box at a time, then save the preset. Every tool on this page is live, so have a play here and the real unit in the rack will feel familiar the first time you lift the lid.

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01 What a processor does

A loudspeaker processor — you'll also hear it called a DSP, a speaker management system or just "the crossover" — lives between the mixer and the amps. The mixer hands it one finished stereo mix. From there it carves that mix into the frequency bands each speaker is built to handle, lines them up in time, keeps the drivers out of trouble, and feeds each band to its own amp channel.

It does four jobs, and you will set them up in this order:

1 • CROSSOVER

Splits the mix by frequency. Bass to the bins, everything above to the tops. A 3-way rig adds a mid band.

2 • EQ

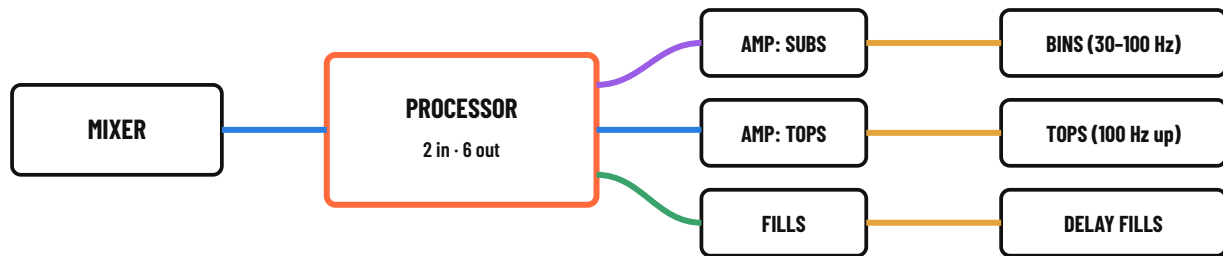
Tames the room and the boxes. For crew: leave it flat unless the engineer has saved a preset.

3 • DELAY

Lines speakers up in time so the subs and tops hit together, and so fills down the room do not echo the mains.

4 • LIMITER

A ceiling on each output. Stops a big amp cooking a speaker when someone pushes the mixer too hard.



Blue is line level on XLR. Yellow is speaker level on Speakon. The processor only ever sees and sends line level: it never touches a Speakon lead.

When you need one, and when you don't

- **Passive rig** (bins and tops on rack amps): always. Without it the amps send full-range to every box and the tops get bass they cannot handle.
- **Powered boxes** (Evovox, powered subs): the DSP is inside the box. You usually do not need a processor, but one is still useful to delay fills and align subs.
- **Mixed rig** (passive mains, powered fills): one processor runs it all. Fills get a full-range output with a high-pass and a delay.

CREW RULE

You do not design the preset. The engineer does that once, in daylight, with a measurement mic. Your job is to load the right preset, route the outputs correctly, prove every box, and never unmute a limiter-less output into a passive speaker.

Typical hire kit: a 2-in / 6-out loudspeaker processor in the amp rack, driving passive double-18 bins and 12" or 15" passive tops.

02 Ins and outs



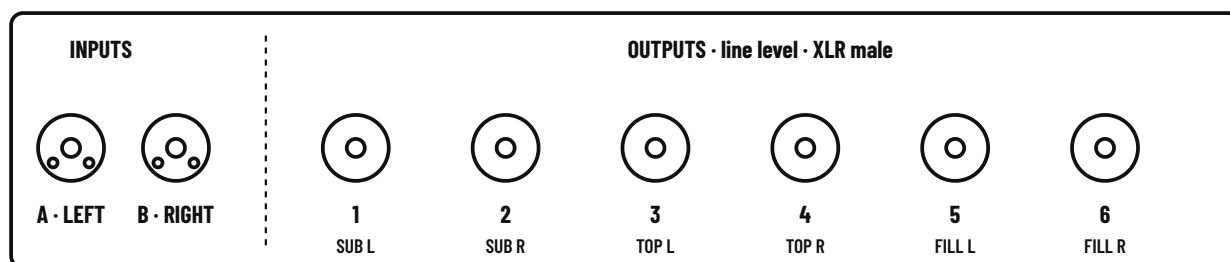
FBT DLM 260 front: screen, encoder, 6 output mutes



Rear: 2 XLR in, 6 XLR out, tape labels

A 2-in / 6-out processor. Front: input meters, the screen, and one mute button per output. Rear: inputs A and B from the mixer, outputs 1 to 6 to the amps, labelled on tape before the first cable goes in. Product photo: FBT.

On a Howzit Live hire rig you'll mostly meet **2-in / 6-out** or **4-in / 8-out** units. The inputs take your mixer's main left and right on XLR; the outputs are XLR too, line level, one per amp channel or powered box. It's all balanced, so you can run those cables a long way without picking up trouble.



A typical 2-in / 6-out rear panel. Inputs are XLR female, outputs XLR male, so you cannot plug a lead in the wrong direction. The labels under the outputs are tape, written by you, before the first cable goes in.

The front panel

- **Input meters:** show signal arriving from the mixer. No meter, no signal: the fault is before the processor.
- **Output mute buttons:** one per output. On site you unmute these one at a time, never all at once.
- **Output meters and limit lights:** a limit light flashing means that output has hit its ceiling. Occasional flicker is fine. Solid is too loud.
- **Preset recall:** the saved setups. Load the one named for tonight's rig. Most units can lock the panel so a knee does not change it mid-show.

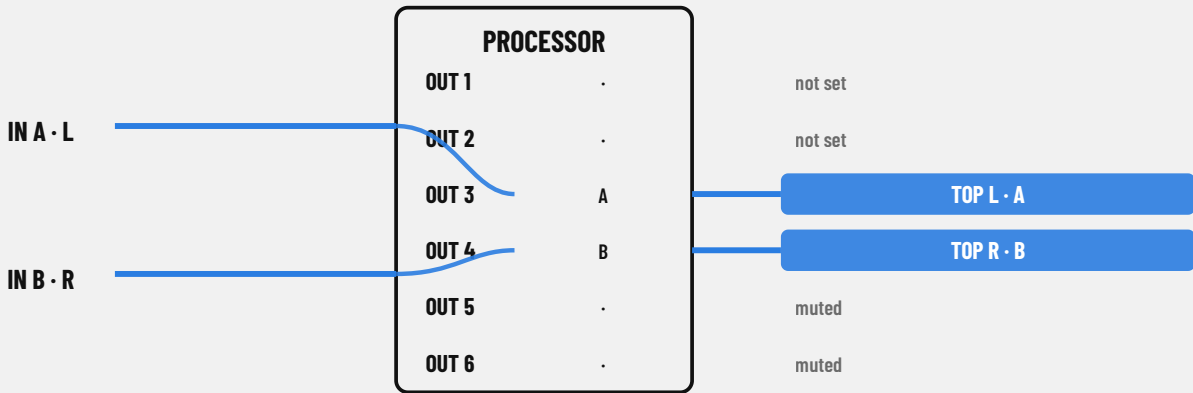
LABEL FIRST, CABLE SECOND

Put a strip of tape under the six outputs and write what each one feeds. Then write the same on the amp inputs. A rig wired against its labels is a rig that will be fault-found in the dark.

03 Routing: which output feeds what

Routing is simply the map from inputs to outputs. Left-side speakers take input A, right-side speakers take input B, and the subs usually take **A+B summed** — bass isn't directional, so one mono feed keeps every bin pushing together. Pick a rig below, set the outputs, and the tool will check your map.

ROUTING MATRIX



Standard map for mono subs + stereo tops: 1 Sub (A+B) · 2 Sub (A+B) · 3 Top L (A) · 4 Top R (B) · 5 Fill L (A, delayed) · 6 Fill R (B, delayed).

Three maps you will use

RIG	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6
2-way, mono subs	Sub A+B	Sub A+B	Top L (A)	Top R (B)	spare	spare
2-way + delay fills	Sub A+B	Sub A+B	Top L (A)	Top R (B)	Fill L (A) +delay	Fill R
3-way stereo	Sub A+B	Sub A+B	Mid L (A)	Mid R (B)	High L (A)	High R

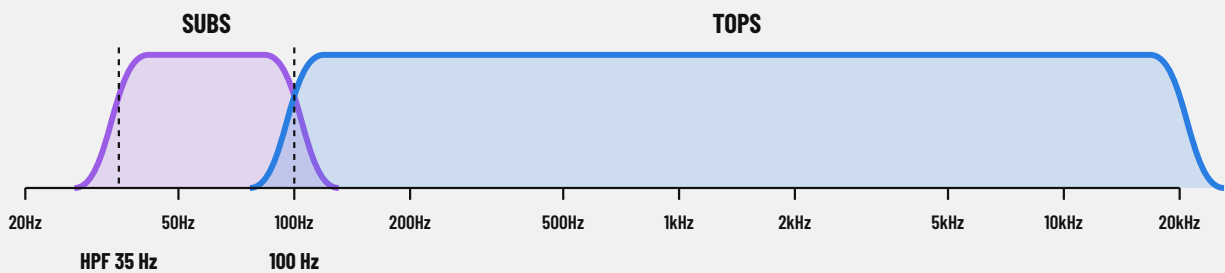
THE CLASSIC MISTAKE

Output 3 is labelled "Top L" but inside the processor it is still set to full range, or still routed from the preset before. The box plays, so nobody checks, and the tops get bass all night. The label is not the routing. The screen is the routing. Check both.

04 Crossover points and slopes

Every output gets a **high-pass filter** (cuts away everything below) and a **low-pass filter** (cuts away everything above). A sub output is high-passed around 30 to 35 Hz to keep the driver safe and low-passed around 100 Hz; a top output is high-passed at that same 100 Hz. Where the two meet is the crossover point. The **slope** tells you how steep the cut is: 24 dB per octave Linkwitz-Riley (LR24) is your safe default, because the two sides add neatly back to flat.

CROSSOVER TOOL



Starting points

OUTPUT	HIGH-PASS	LOW-PASS	SLOPE	WHY
Double-18 bins	35 Hz	100 Hz	LR24	Below 35 Hz the cone just flaps. Above 100 Hz you start to hear voices from the bins.
12" or 15" tops	100 Hz	off (20 kHz)	LR24	Matches the bins. Lower only if the tops are big 15s and there are no bins.
Mids(3-way)	100 Hz	1.6 kHz	LR24	The horn takes over around 1.2 to 2 kHz; the box's spec sheet gives the exact number.
Highs(3-way)	1.6 kHz	off	LR24	Never below the spec-sheet minimum. A horn fed too low dies quietly, then suddenly.
Delay fills (powered)	80 Hz	off	BW12	The box's own DSP does the rest. High-pass only keeps the bass with the bins.

WHERE THE NUMBERS COME FROM

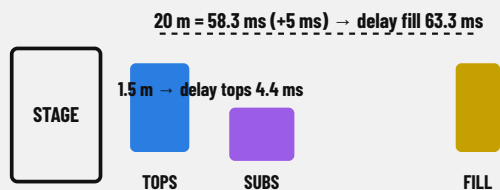
The speaker's spec sheet. Every passive box lists a recommended crossover and a minimum high-pass. The processor does not know what is plugged into it. If you set a horn output to 500 Hz because it "sounded fuller", you have bought a diaphragm.

Typical starting points: double-18 bins 35 Hz to 100 Hz; 12" or 15" tops high-passed at 100 Hz; powered column fills high-passed at 80 Hz with their own DSP left flat.

05 Delay and polarity

Sound moves at about **343 metres per second**: near enough 2.9 milliseconds for every metre. So if the subs sit two metres ahead of the tops, their sound lands early; and if a fill speaker stands 20 m down the room, it fires 58 ms ahead of the mains and the crowd next to it hears a slap-back echo. Delay sorts out both: you hold the nearer speaker back until everything lines up.

DELAY CALCULATOR



Fill delay = distance ÷ 0.343 + 5 ms. Example: 20 m fill = 58 + 5 = 63 ms. Subs 1.5 m ahead of tops: delay the tops by 4.4 ms.

The fill rule

Delay the fill by its distance from the mains, plus about 5 ms. The extra few milliseconds make the mains arrive a touch first, so the ear locates the sound at the stage and the fill just adds level. Put the delay on the fill's output, not on the mains.

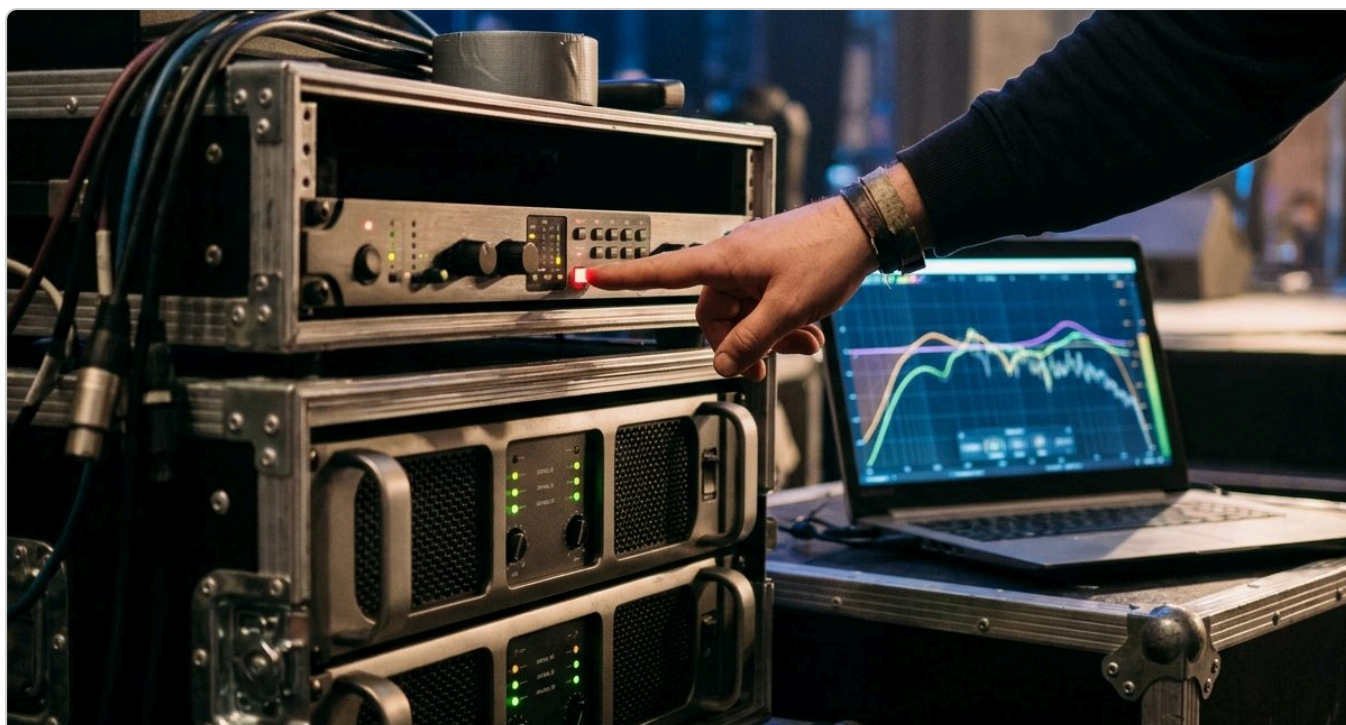
Polarity: the two-second check

Subs and tops can be out of polarity: one pushing while the other pulls, at the crossover frequency. The bass goes thin exactly where the two overlap. The test: play a track with a steady kick drum, stand in front of the stack, and flip the polarity button on the sub output. One setting has clearly more punch. Keep that one. If you cannot hear a difference, the delay is wrong, fix that first.

FIELD RULE

Delay the fill, not the mains. Delay the tops to the subs, not the subs to the tops. Then flip polarity on the subs and keep whichever is louder.

Powered columns or small tops on the spare outputs make good delay fills down a long room. One output each, delayed to the mains.



Unmute one output at a time with the limiter already on. The laptop is the engineer's measurement rig; crew only need the mute buttons and the meters.

A limiter is just a ceiling. Anything under the threshold sails through untouched; anything over it gets squashed so the amp can never hand the speaker more than it can take. Every passive-speaker output needs one, and you set it **before** that output is ever unmuted. It's the only thing standing between a 2 000 W amp and a 600 W driver when the DJ buries the master in the red at 1 a.m.

LIMITER HEADROOM

Headroom = $10 \times \log_{10}(\text{amp W} \div \text{speaker RMS W})$. Set the limiter at least that many dB below the amp's clip point, then 2 dB more for safety.

Gain structure: everything at zero

1. **Mixer:** main fader at 0, meters peaking around 0 dB on a loud track.
2. **Processor:** input gain 0 dB, output gains 0 dB. Volume is not set here.
3. **Amps:** attenuators fully up, or at the engineer's marked position. Not "a bit down to be safe": that only moves the clip point and breaks the limiter maths.
4. **Limiters:** set from the amp-to-speaker ratio above, then 2 dB more conservative. Red limit lights should flicker on peaks, never stay lit.

NEVER

Never unmute a passive-speaker output with the limiter switched off "just to test it". Test with the limiter on. If the limiter is wrong, the test will tell you. If it is off, the speaker will.

07 The setup process



The checklist lives inside the rack lid. Tick it every show. Nobody remembers step 7 at 1 a.m.

This is the running order. Print it, tape it inside the amp-rack lid, and tick it off every single show. On a rig you know it's ten minutes; on one you don't, it saves you the first frantic half-hour.

1 ☐ EVERYTHING OFF, EVERYTHING MUTED

Amps off. All six processor outputs muted. Mixer master down. Cables labelled at both ends.

2 ☐ CABLE IT TO THE LABELS

Mixer L and R into inputs A and B. Each output to the amp channel or powered box written on its tape. Speakon from amp to box.

3 ☐ POWER UP FROM THE SOURCE

Mixer, then processor, then amps. Check the processor shows input signal on the meters with the mixer playing a track at 0 dB.

4 ☐ LOAD THE PRESET

Recall the preset named for this rig. No preset? Start flat, then set routing, crossovers and limiters from Lessons 3, 4 and 6.

5☐ **CHECK ROUTING ON THE SCREEN**

For each output: which input (A, B, A+B), which band, mute state. The label is not the routing.

6☐ **CHECK CROSSOVERS AND HIGH-PASSES**

Subs 35 to 100 Hz. Tops from 100 Hz. Fills from 80 Hz. All LR24. Match the spec sheet.

7☐ **CHECK LIMITERS**

Every passive output has one and it is on. Threshold from the amp-to-speaker headroom, minus 2 dB.

8☐ **UNMUTE ONE OUTPUT AT A TIME**

Track playing. Unmute output 1. Walk to the box it should feed. Right box? Right band (bins only thump, tops have no bass)? Mute it, next output.

9☐ **DELAY AND POLARITY**

Delay the tops to the subs, fills to the mains. Flip sub polarity and keep the louder one.

10☐ **SAVE AND LOCK**

Save as a new preset: venue, date, rig. Lock the front panel. Note the preset name on the rack tape.

If it is wrong

YOU HEAR	MOST LIKELY	CHECK
Voices coming out of the bins	Sub output set full range or low-pass too high	Sub output low-pass: should be about 100 Hz
Tops sound thin, no weight	Tops high-passed too high, or subs muted	Top HPF about 100 Hz; sub output unmuted; cable to the sub amp
Bass gets weaker when tops come on	Polarity or delay between subs and tops	Flip sub polarity; set top delay to the sub distance
Echo near the back of the room	Fill not delayed	Fill delay = distance ÷ 0.343 + 5 ms
One side silent, input meters fine	Output muted, or wrong routing on that output	Mute button; output screen; XLR to the amp
Limit light solid red on one output	Threshold too low, or that output's gain too high	Output gain back to 0; recheck limiter maths
Nothing on the input meters	Fault before the processor	Mixer master, mixer meters, the two XLRs into A and B

THE WHOLE MODULE IN ONE LINE

Label, route, cross over, limit, prove each box, align, save. In that order, every time.

Check what you learnt

Ten questions. Circle one answer for each. The answer key is on the last page. Pass mark: 8 out of 10.

1. Where does the processor sit in the chain?

- ☐ A Between the CD player and the mixer
- ☐ B Between the mixer and the amplifiers
- ☐ C Between the amplifier and the speakers
- ☐ D After the speakers, on the Speakon line

2. A 2-in / 6-out processor. The mixer's main L and R go to...

- ☐ A Outputs 1 and 2
- ☐ B Inputs A and B
- ☐ C Any two outputs
- ☐ D Input A only, B is for the DJ

3. Subs on a normal 2-way rig are best fed from...

- ☐ A Input A only
- ☐ B Input B only
- ☐ C A+B summed (mono)
- ☐ D Whichever input has more bass

4. Typical sub output filters for double-18 bins?

- ☐ A High-pass 35 Hz, low-pass 100 Hz
- ☐ B High-pass 100 Hz, low-pass off
- ☐ C High-pass 20 Hz, low-pass 500 Hz
- ☐ D No filters: the amp sorts it out

5. Which slope is the safe default for crossovers?

- ☐ **A** 6 dB/octave Butterworth
- ☐ **B** 24 dB/octave Linkwitz-Riley (LR24)
- ☐ **C** 48 dB/octave Bessel
- ☐ **D** Whatever the preset before used

6. A fill speaker stands 20 m from the mains. Delay for the fill output?

- ☐ **A** About 20 ms
- ☐ **B** About 63 ms (58 + 5)
- ☐ **C** About 200 ms
- ☐ **D** None; delay the mains instead

7. The subs sit 1.5 m in front of the tops. What do you delay?

- ☐ **A** The subs by 4.4 ms
- ☐ **B** The tops by 4.4 ms
- ☐ **C** Both by 4.4 ms
- ☐ **D** Nothing: 1.5 m doesn't matter

8. How do you check sub-to-top polarity on site?

- ☐ **A** Look at the XLR pins
- ☐ **B** Flip polarity on the sub output and keep the louder setting
- ☐ **C** Turn the subs down until it sounds right
- ☐ **D** Measure the cable length

9. A 1200 W amp drives a 600 W RMS speaker. The limiter should sit...

- ☐ A Off: the amp is only double
- ☐ B At least 3 dB below the amp's clip point, then 2 dB more for safety
- ☐ C At the amp's clip point
- ☐ D At +3 dB above clip

10. Correct order when proving the rig?

- ☐ A Unmute all six outputs and listen
- ☐ B Unmute one output at a time, walk to the box, confirm the band, mute, next
- ☐ C Unmute the subs first, then everything else together
- ☐ D Leave it to the DJ

Answer key

1. **B.** Mixer → processor → amps (or powered boxes) → speakers. It only ever handles line level on XLR.
2. **B.** Inputs A (left) and B (right). Outputs are what feed the amps.
3. **C.** Bass isn't directional. A mono sum keeps every bin playing the same thing instead of fighting on a wide stereo mix.
4. **A.** 35 Hz protects the driver from air it can't move; 100 Hz keeps voices out of the bins.
5. **B.** LR24: the two sides sum back to flat at the crossover point. Most spec sheets assume it.
6. **B.** 2.9 ms per metre: 20 m = 58 ms, plus about 5 ms so the mains arrive a touch first. Delay the fill, never the mains.
7. **B.** Hold the nearer speaker back. The subs are nearer the audience, so the tops get the delay: $1.5 \div 0.343 = 4.4$ ms.
8. **B.** Steady kick drum, stand in front, flip the button. One setting has clearly more punch. Keep it. If no difference, fix the delay first.
9. **B.** $10 \times \log_{10}(1200 \div 600) = 3$ dB. Set the limiter at least that far below clip, plus a couple of dB. Never run a passive output without it.
10. **B.** One output at a time. You confirm each box gets the right band before anything is loud. Then delay, polarity, save, lock.

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howzitlive.co.za · Module 7 · End of the beginner course. Next: the crew practical.