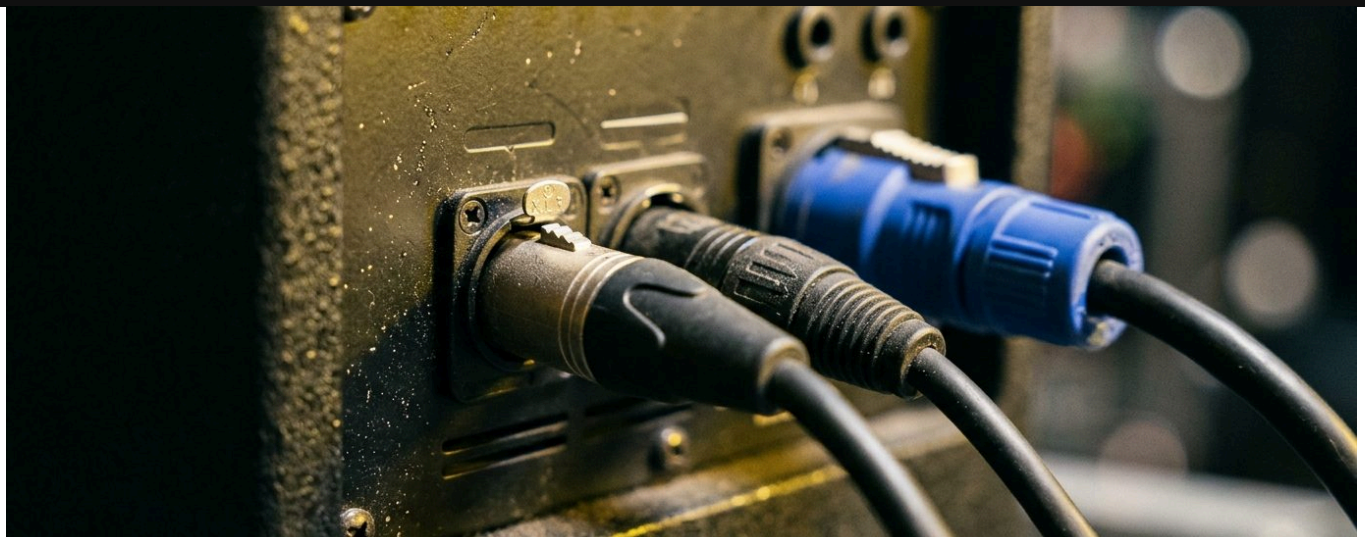
B&W PRODUCTIONS · CREW TRAINING · MODULE 6

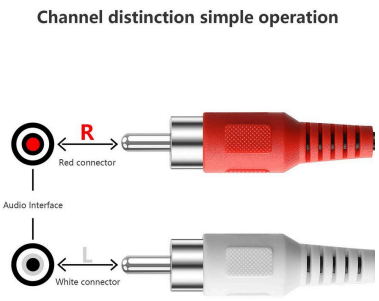
Wiring It Up

How the cables actually run. CD player or controller into the mixer, mixer into powered speakers, adding a third box, putting a processor in the chain, and driving passive speakers from an amp. Every diagram is live: hover the cables, flip the switches, then play Soundcheck and find the faults.

B&W Productions · Proper Planning, Prevents Poor Performance



01 Connectors: what plugs into what



RCA: CD / controller out



TRS jack: line level



XLR: mic and line



Speakon: amp to passive speaker



powerCON: 230 V to powered box



5-pin XLR: DMX only, never audio

Every plug in this module. Speakon carries speaker level: it only ever goes between an amplifier and a passive box.

Every rig in this module uses four cable types. Learn the four and you can read any wiring diagram on site. The colour code below is used in every diagram on this page.

CABLE	LOOKS LIKE	CARRIES	BALANCED?	RULE
RCA (phono)	Red and white pair of push-on plugs	Line level from CD players, DJ controllers, laptops	No. Unbalanced.	Keep it short: under 3 m. Longer picks up hum. Use a DI box for a long run.
XLR	3-pin, latching	Mic level or line level. Mixer outputs to powered speakers or amps.	Yes.	Can run 50 to 100 m without hum. The standard for everything between mixer and speakers.
6.35 mm jack	Guitar-lead plug. TS (two rings) or TRS (three)	TS: unbalanced. TRS: balanced line.	TRS yes, TS no.	A TS jack over 10 m is a hum generator. Prefer XLR for anything between mixer and speaker.
Speakon	Round, twist-lock, 2 or 4 pole	Amplifier output to a passive speaker. High current.	n/a (power)	Only ever amp-to-passive-speaker. Never into a mixer, a powered speaker or a processor.
Mains	3-pin or 16 A Commando	230 V to every powered box	n/a	Powered speakers need two cables: signal (XLR) and power. Forgetting the second one is the number-one "dead speaker" on site.

> **THE ONE RULE**
> Signal cables carry a whisper. Speaker cables carry a shove. Red RCA and blue XLR never go where a yellow Speakon goes, and the other way round.

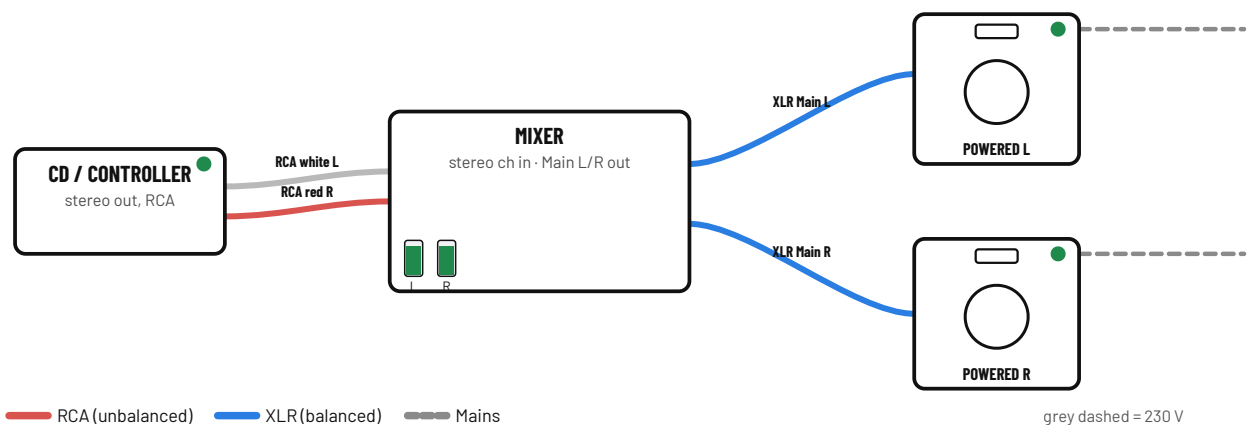
02 Stereo into powered speakers



Controller into the mixer on RCA, mixer out to the speakers on XLR. Keep the spare leads coiled next to the desk, not under it.

The most common rig at a corporate event. One stereo source, one mixer, two powered speakers. Three things to get right: the source is stereo so it needs two cables; the mixer's main output is stereo so it needs two cables; each powered speaker needs signal *and* power.

In the B&W kit: Evox 8 and Evox 12 columns, the JBL powered subs and the DAS 208A elements are all powered boxes. XLR in, XLR link out, power in.



Hover or tap any cable or box to read what it is. Red/white RCA from the CD player or controller into one stereo channel on the mixer. Blue XLR from Main L and Main R out to the left and right speaker. Grey power to each speaker.

WHAT'S THIS?

- CD player / controller → mixer: red and white RCA, unbalanced, under 3 m, into one stereo line channel (or two mono channels panned L and R).
- Mixer Main L → left speaker, Main R → right speaker: XLR, balanced, any length up to 100 m.
- Each powered speaker: XLR in + 230 V mains. Gain knob on the back at about three-quarters.

Common mistakes on this rig

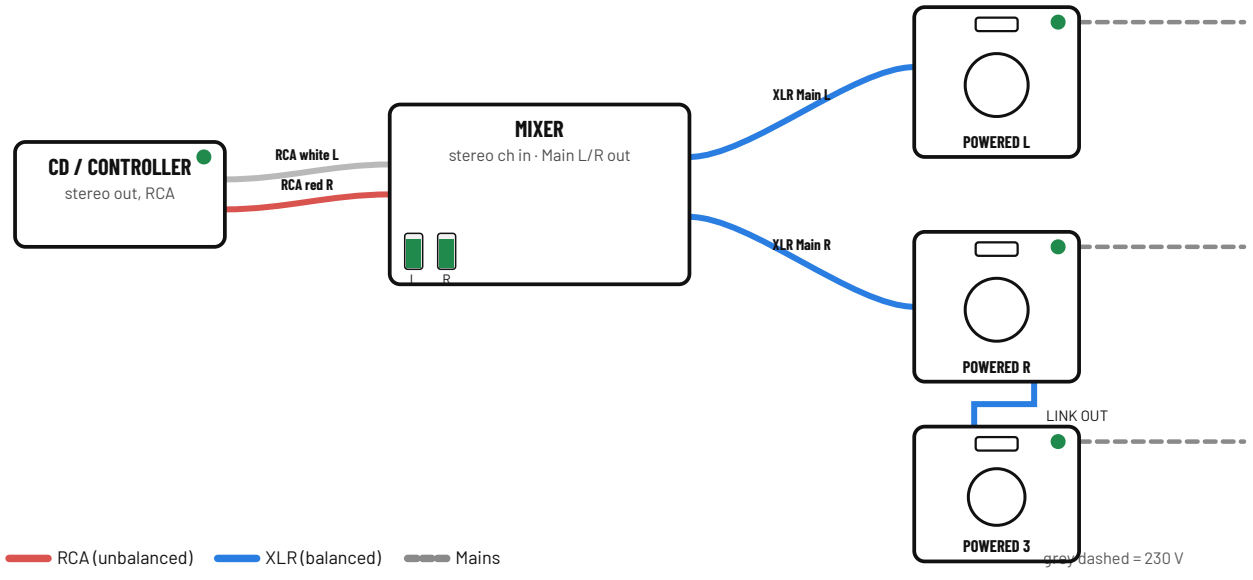
- Only one RCA plugged in: the source is mono on one side, so one speaker is quiet or silent.
- Both XLRs out of Main L: both speakers play the left channel. It works, but it's mono, and any stereo pan on the mixer vanishes.
- Speaker gain at full with the mixer at −20: hiss. Mixer at unity, speaker at three-quarters (Module 2, Lesson 8).

03 Adding a third powered speaker



The Evox 8 rear panel: input in, link (thru) out. The link is a copy of the input at line level, ready for the next powered box. Photo: RCF.

Every powered speaker has an XLR **link** (sometimes marked **thru** or **out**) next to the input. It is a straight copy of whatever comes in. Plug an XLR from the link of one speaker into the input of the next and you have added a box with no extra mixer outputs. This is the powered-speaker version of "parallel", and because each box has its own amp, there are no ohms to worry about.



The third speaker hangs off the right speaker's link out. It plays the right channel. Put it where you need more right-side coverage, or feed it from a mono output on the mixer if it's a fill at the back.

TRY IT: LINK A THIRD BOX

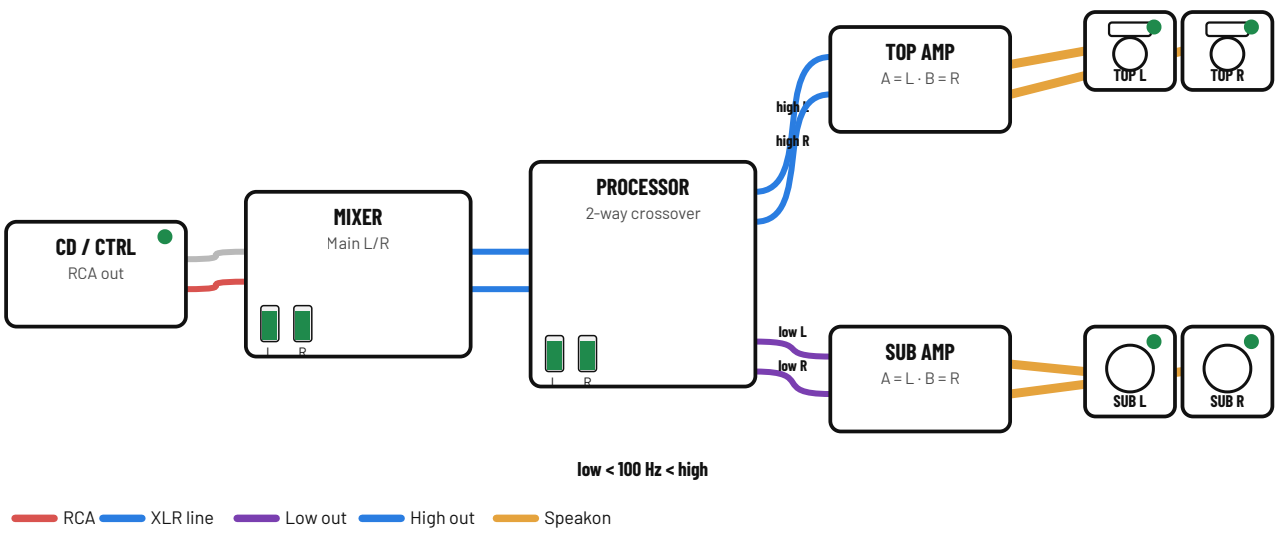
Link/thru is a copy of the input. You can chain several boxes. Rule of thumb: no more than four on one chain, and check the last box's input is still clean. A fill at the back is better fed from a mono or aux output on the mixer, with its own delay if it's more than 15 m from the mains.

LINK OUT IS NOT A SPEAKON

The link carries line level, not speaker power. It needs the next box to be a powered speaker. Linking into a passive box does nothing.

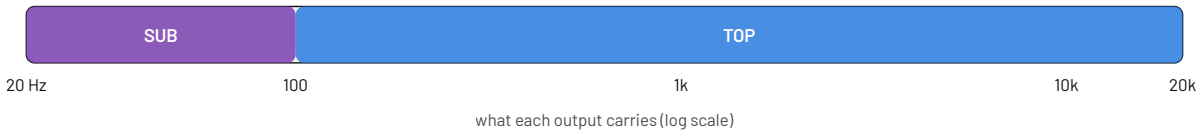
04 A processor in the chain

When tops and subs are separate boxes, something has to split the signal: bass to the subs, everything else to the tops. That is the processor (also called a crossover, DSP or system controller). It sits between the mixer and the amps or powered boxes. Modern powered subs often have the crossover built in, but a separate processor lets you set it properly and add delay and limiting.



Mixer Main L/R into the processor. Two-way: the processor sends low L/R to the sub amp and high L/R to the top amp. Three-way adds a mid band for a separate mid driver or amp channel.

TRY IT: TWO-WAY OR THREE-WAY, AND WHERE IT CROSSES



what each output carries (log scale)

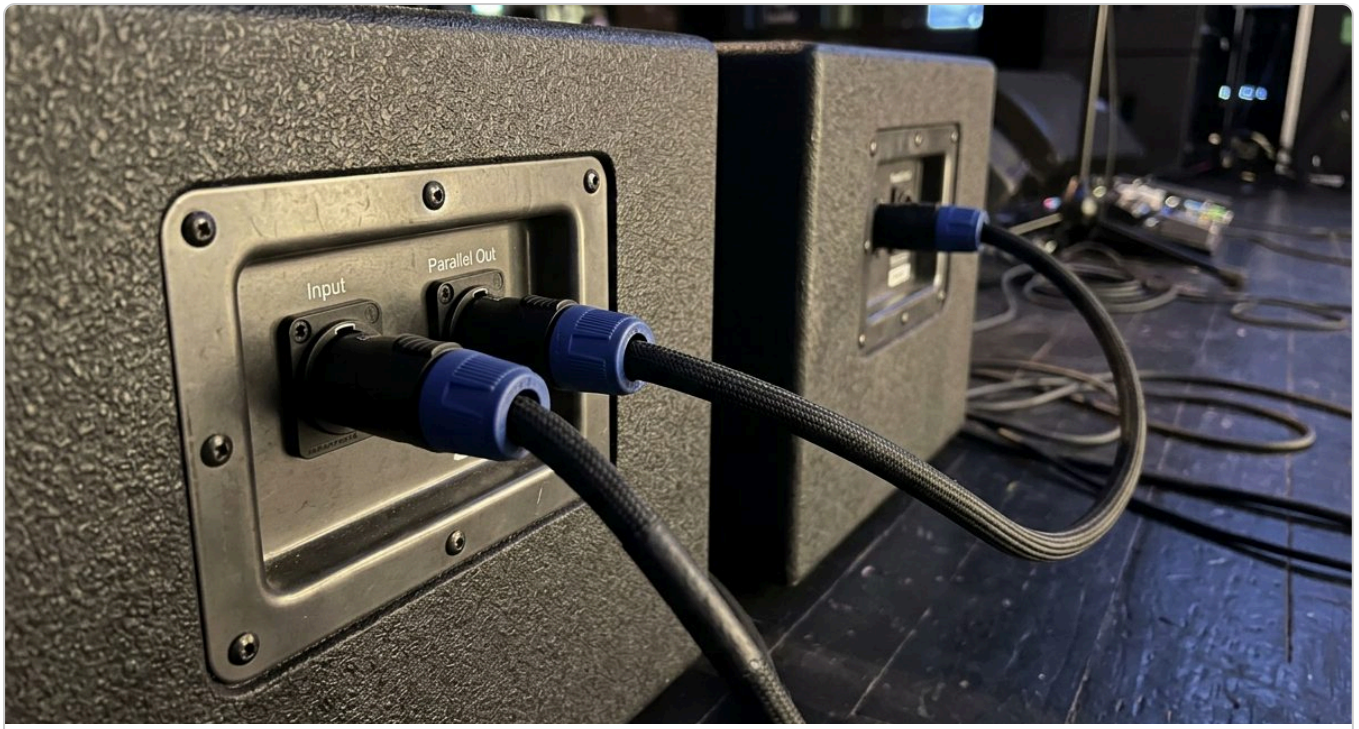
SETUP	CROSSOVER POINTS	GOES WHERE
Two-way	`80 to 120 Hz (100 Hz typical)`	Below: sub amp or powered sub. Above: top amp or powered top.
Three-way	`80 to 100 Hz, then 1.2 to 2 kHz`	Sub, mid driver, horn. The second point comes from the speaker's spec sheet.

Use 80 Hz when the tops are 15" boxes that carry some bass. Use 100 to 120 Hz with 10" or 12" tops. The processor also holds the limiter and any delay for fills.

WHY BOTHER

Without a crossover the tops try to play bass they can't, and the subs play vocals they shouldn't. Splitting the job makes both boxes louder and cleaner. Module 7 covers how to set the processor up.

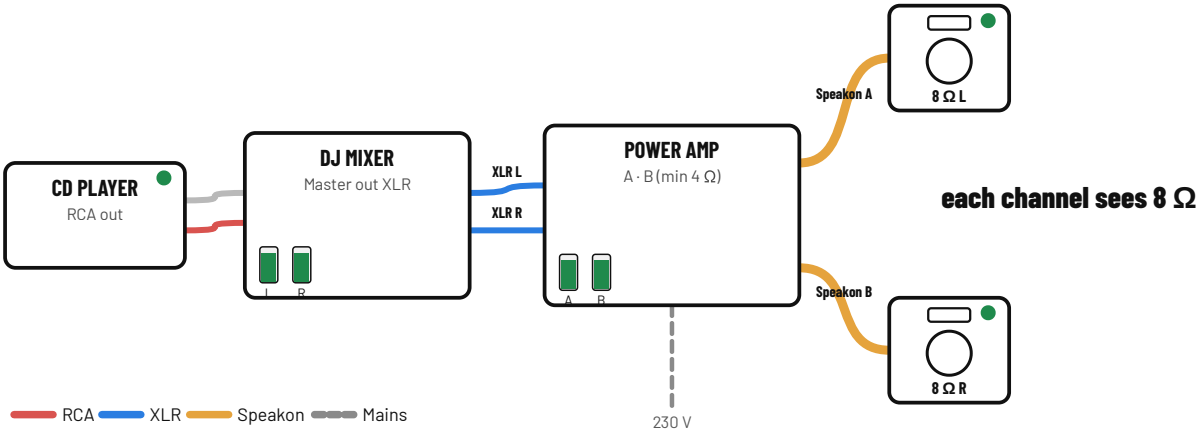
05 Amp and passive speakers: the ohms



Second passive box linked off the first. The amp now sees 4 Ω on that channel.

Old school, and still how line-array elements and many hire rigs run. The mixer feeds a power amplifier. The amp drives passive speakers over Speakon leads. Now the ohms matter, because the amp sees every box you hang on a channel.

In the B&W kit: the DAS 208A line-array elements are powered boxes. The passive side is the DAS Action-S218 double-18 bins and the Lynx tops, on the Crown XTi and Powerworks amps with Speakon leads. There the ohms matter.



CD player into the DJ mixer. Master L/R out on XLR into the amp's inputs. Amp channel A to the left speaker, channel B to the right, on Speakon. One 8 Ω box per channel.

TRY IT: ADD BOXES PER SIDE

BOXES PER CHANNEL	LOAD	TYPICAL AMP OUTPUT	VERDICT (4 Ω AMP)
1 × 8 Ω	`8 Ω`	`500 W`	Safe
2 × 8 Ω linked	`4 Ω`	`~850 W`	At the limit, allowed, about +4 dB louder
3 × 8 Ω linked	`2.7 Ω`	`amp protects or fails`	Not allowed

LINKING PASSIVE BOXES

Link out on a passive speaker is a parallel connection. Two 8 Ω boxes make 4 Ω. More current, more power, more heat. Stop at the amp's minimum load, printed on its back.

06 Soundcheck: find the fault

Ten problems. Each one shows a rig, what you hear, and what the meters show. Click the cable or box you think is at fault. The meters are the clue: signal on a meter means everything before that point is fine.

Score 0

Spot the fault (printed version)

Cover the answers. For each problem, write down which cable or box you would check first, then compare.

1. **Sound from the right speaker only. The mixer's L meter is dead, R is moving.** Rig: powered speakers.
2. **Right speaker only. Both mixer meters are moving.** Rig: powered speakers.
3. **Left speaker only. Both mixer meters moving. The right speaker's power light is off.** Rig: powered speakers.
4. **Left side loud, right side quiet. Both RCAs are plugged in. The mixer's R meter barely moves.** Rig: powered speakers.
5. **Tops sound fine. No bass at all from the subs. The sub amp's power light is on.** Rig: processor rig.
6. **Everything plays, but the singer who is standing on the left comes out of the right top. Bass is fine.** Rig: processor rig.
7. **Speakers L and R are clean. The third speaker, linked from R, has a loud hum.** Rig: powered speakers.
8. **Passive rig. Right speaker crackles and cuts in and out. The amp's B meter is steady.** Rig: amp and passive speakers.
9. **Passive rig, three 8 Ω boxes linked per side. Sound for ten minutes, then the amp shuts down with a protect light.** Rig: amp and passive speakers.
10. **Dead silence. Everything is plugged in and powered. Both mixer meters are dead. The CD player is playing.** Rig: powered speakers.

Answers

1. **RCA white: left channel, unbalanced line level.** The white RCA (left) from the CD player is faulty or unplugged. Signal never reaches the mixer's left side, so nothing after it can fix it. *Fix: Swap the RCA lead. Reseat both ends.*
2. **XLR, Main L out to left speaker.** The XLR from Main L to the left speaker is faulty or unplugged. The mixer has signal; the speaker never gets it. *Fix: Swap the Main L XLR. Check it's in the Main out, not an aux.*
3. **230 V mains to speaker R.** No mains to the right speaker. A powered box needs two cables. Signal without power is a very quiet speaker. *Fix: Plug in the power lead, switch the box on, check the extension lead and the distro outlet.*
4. **Mixer.** The channel is panned hard left (or the source is on two mono channels, both panned left). The mixer is doing exactly what it's told. *Fix: Centre the pan on a stereo channel, or pan the two mono channels hard L and hard R.*
5. **Processor (crossover/DSP).** The processor's low outputs are muted, or the crossover is set so high the subs get nothing. The sub amp is powered but is being fed silence. *Fix: Unmute the low band on the processor. Check the crossover is around 100 Hz, not 20 Hz.*
6. **Processor high out L → top amp.** The high outputs are swapped: high L is plugged into amp channel B and high R into A. Vocals (highs) swap sides; the subs (lows) are correct, so you can't hear it in the bass. *Fix: Swap the two high XLRs at the top amp. Label them.*
7. **XLR from speaker R LINK OUT to speaker 3 input.** The link lead to the third box is an unbalanced jack lead (or a damaged XLR with the shield open) over a long run. Unbalanced cable picks up hum; balanced XLR cancels it. *Fix: Replace the link with a proper XLR. If the run is over 30 m, check the speaker and the mixer are on the same power phase.*
8. **Speakon, amp channel B to right speaker.** The Speakon from amp channel B to the right speaker is loose or has a broken core. Intermittent speaker-level contact crackles and can damage the amp. *Fix: Switch the amp off. Reseat and twist-lock the Speakon at both ends. Swap the lead if it continues.*
9. **Power amplifier.** Three 8 Ω boxes in parallel is 2.7 Ω per channel. The amp's minimum is 4 Ω. It overheats and protects itself. *Fix: Take one box off each side (4 Ω), or add a second amp and split the boxes across more channels.*
10. **Mixer.** Channel gain at zero, channel muted, or the fader down. The mixer is receiving the signal but not passing it. The meters tell you: dead meters with a live source means mixer settings. *Fix: Gain up, mute off, fader to unity, main fader up. Check the channel's input selector (line vs mic).*

07 Wiring order and the two-minute check

Wire in the same order every time, then test the chain from the source forward before doors. It takes two minutes and it catches nine faults out of ten.

1. **Power first, switched off.** Mains to every powered box and the amp. Nothing on yet.
2. **Speaker side.** XLR from mixer mains to speakers (or to processor, then amps, then Speakon to passive boxes). Label each lead at the mixer end: "L", "R", "Sub".
3. **Source side.** RCA from CD player or controller into the mixer. Red to right, white to left. Check the mixer channel is a stereo line channel, or two channels panned hard L and hard R.
4. **All gains and faders down.** Mixer on. Processor on. Speakers or amp on, last.
5. **Play a track you know.** Bring up the channel fader to unity. Watch the mixer meters: both L and R moving? Then the processor meters. Then listen at each box in turn.
6. **Walk the room.** Stereo image sits in the middle, bass present, no hum. Mute, and the room goes silent (no buzz means no earth loop).

WHAT YOU HEAR	WHERE THE SIGNAL STOPS	LOOK AT
Nothing at all, mixer meters dead	Before the mixer	Source playing? RCA in the right channel? Channel gain up?
Nothing at all, mixer meters moving	After the mixer	Main fader, main XLRs, speakers powered and gain up, processor mutes
One side only, mixer meters show both	After the mixer, that side	That side's XLR, that speaker's power, that amp channel
One side only, mixer meter shows one	Before the mixer, that side	That RCA, the channel pan, a mono source
No bass	Sub path	Processor low out, sub amp, sub power, sub polarity
Hum or buzz on one box	That cable run	Unbalanced lead over 5 m, missing earth, different power phase

08 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. A CD player's RCA leads are red and white. Which is which?

- ○ **A** Red is left, white is right
- ○ **B** Red is right, white is left
- ○ **C** Either, they are identical
- ○ **D** Red is power, white is signal

2. How many cables does a powered speaker need to make sound?

- ○ **A** One: the XLR
- ○ **B** Two: XLR signal and 230 V power
- ○ **C** Three: XLR, Speakon and power
- ○ **D** None, it is wireless

3. You plug both speakers into Main L on the mixer. What happens?

- ○ **A** Nothing plays
- ○ **B** Both play the left channel, so the mix is mono
- ○ **C** The mixer overheats
- ○ **D** The right speaker plays the right channel anyway

4. What does the LINK (thru) XLR on a powered speaker send out?

- ○ **A** Speaker-level power for a passive box
- ○ **B** A copy of the line-level signal coming in
- ○ **C** Only the bass
- ○ **D** Nothing unless the speaker is switched off

5. **Three powered speakers are linked from one mixer output. What load does the mixer see?**

- ○ **A** 2.7 Ω
- ○ **B** 4 Ω
- ○ **C** It doesn't matter: each box has its own amp
- ○ **D** 8 Ω

---

6. **Where does a processor (crossover) sit in the chain?**

- ○ **A** Between the CD player and the mixer
- ○ **B** Between the mixer and the amps or powered boxes
- ○ **C** After the speakers
- ○ **D** Inside the Speakon cable

---

7. **A typical two-way crossover point between subs and tops is...**

- ○ **A** 20 Hz
- ○ **B** 100 Hz
- ○ **C** 1 kHz
- ○ **D** 10 kHz

---

8. **Passive rig: you link a second 8 Ω box to each side. The amp now sees...**

- ○ **A** 16 Ω and less power
- ○ **B** 8 Ω, no change
- ○ **C** 4 Ω and more power
- ○ **D** 2 Ω and it shuts down

---

9. **Right speaker silent. Both mixer meters moving. Where do you look first?**

- ○ **A** The CD player
- ○ **B** The RCA leads
- ○ **C** The Main R XLR and the right speaker's power
- ○ **D** The mixer's channel gain

---

10. **Correct power-up order for a rig with a processor?**

- ○ **A** Speakers → processor → mixer
- ○ **B** Mixer → processor → speakers/amps
- ○ **C** Amps first so they warm up
- ○ **D** All at once from the distro

Answer key

1. **B**. Red = right, white = left. Everywhere, every brand.
2. **B**. Signal and power. A powered box with signal but no mains is the most common 'dead speaker' on site.
3. **B**. The mixer doesn't care, it just copies Main L to both. You lose stereo; nothing breaks.
4. **B**. A straight copy of the input, at line level. Feed it to the next powered box. It will not drive a passive speaker.
5. **C**. Ohms only matter between a power amp and a passive speaker. Powered boxes take line level; the mixer is fine.
6. **B**. Mixer → processor → amps/powered boxes → speakers. It splits the full signal into bands before anything amplifies it.
7. **B**. 80 to 120 Hz, 100 Hz as the default. Lower if the tops are 15" boxes that carry some bass.
8. **C**. Parallel halves the impedance: 4 Ω. Most amps give more power into 4 Ω (about +4 dB with two boxes). Stop at the amp's minimum.
9. **C**. Meters moving on both sides means everything up to the mixer output is fine. The fault is after it, on the right.
10. **B**. Source end first, speakers last, every gain down. Reverse to switch off. No thumps reach the drivers.

Photos: product images courtesy of the manufacturers (RCF, Neutrik) and their distributors; scene photographs are AI-generated illustrations and do not show B&W Productions equipment or events.