



Processing Amplifier Platform Technical Notes

CXD, CXD-Q, PLD, DPA, and DPA-Q Series

Excessive high-frequency noise

Some installed sound systems using CXD amplifiers have exhibited audible high-frequency noise in the loudspeakers when at idle (no signal passing through). The cause was found to be a combination of amplifier topology with long loudspeaker cable runs made up of bundled single wires. As a result of this loudspeaker wiring arrangement, the residual Class D switching noise in the various amplifier channel outputs couples easily into the other channel outputs and causes audible hiss or hash, particularly from high-frequency horns and drivers, while the system is running but at idle.

This technical note applies to CXD4.3, CXD4.5, CXD4.3-Q, and CXD4.5-Q amplifier models, but also to PLD4.3, PLD4.5, DPA4.3, DPA4.5, DPA4.3-Q, and DPA4.5-Q models because they all use an identical self-clocking Class D topology.

Pre-installation preventive design

Preventing this problem during design and installation is invariably less costly and more effective than any remedial work, after the installation has been done, would be. Because crosstalk among multiple loudspeaker wires is the cause of the problem, it is important to design the system using wiring techniques that prevent crosstalk even among bundled wires.

Twisted pair wiring

For this reason, QSC always recommends using twisted-pair wiring for each loudspeaker cabling run. The twists help minimize the loop area of each loudspeaker cable run and thus reduce both the radiation of switching noise and the susceptibility to picking it up from other nearby wires. Multiple twisted pairs can be bundled together to route through conduits, cable raceways, etc. The wires must also, of course, meet all applicable codes and be sized appropriately for the load impedance and run length.

In Figure 1, the two single wires shown at top create a very large loop area and will create a very effective antenna for both radiating and picking up high-frequency switching noise. In a bundle with other similar loudspeaker cable pairs, the whole thing will act like a large air-core transformer, coupling switching noise transients among the many loops. Twin-conductor wire reduces but does not fully minimize the loop area. Twisted pair wires as shown at the bottom will optimally reduce the loop area. Twisted-pair wire is commonly available in jacketed form suitable for use in systems.

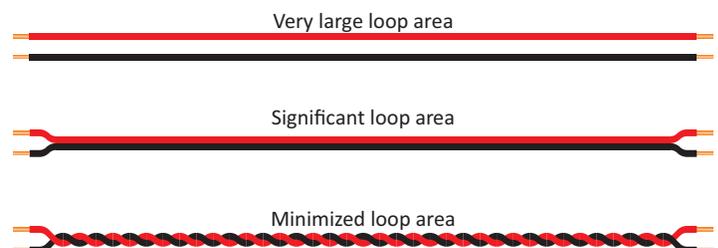


Figure 1. Reduce the loop area of loudspeaker cabling by using twisted pair wire.

If it is not possible to use twisted pair wiring, consider reducing the number of wire pairs in each bundle, even though it will require using more separate bundles.

Ferrite chokes

As an added precaution, you may consider also installing clamp-on ferrite chokes over the wires near where they connect to the amplifier outputs (Figure 2).

Remediation in an existing system

Correcting a noise crosstalk issue in bundled loudspeaker cabling after the system has already been installed is not an easy task. Solutions may include these actions:

- Replace loudspeaker cabling with jacketed twisted-pair wire.
- Install clamp-on ferrite chokes onto loudspeaker wires.
- Last resort: replace power amplifiers on the high-frequency drivers with alternate QSC models; possibilities include CXD4.2, CXD4.2-Q, PLD4.2, DPA4.2, or DPA4.2-Q; equivalent models from CX Series (with IO Frame and DataPort card, if they are part of a Q-SYS system), PLX2 Series, or DCA Series.

If it is not feasible to replace the cabling with an equivalent quantity of twisted pairs, then it may be necessary to add one or more ferrite chokes (with clamp-on cores) over the wires near where they connect to the amplifier outputs. The ferrite chokes add an inductive reactance to the loudspeaker lines that helps decouple the high-frequency energy of the switching noise transients from the amplifier outputs. Depending on the severity of the noise problem, you might need to keep adding ferrite chokes until the noise is reduced to a satisfactory level.

NOTE: Replacing the power amplifiers may be an undesirable solution because the amplifiers of the PLD/CXD/DPA platform are feature-rich with multiple processing and configuration options and are usually selected for that reason.

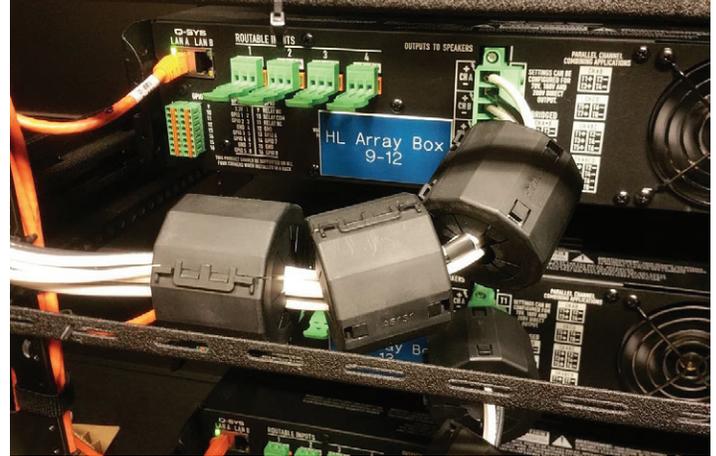


Figure 2. Ferrite chokes help decouple cross-coupled switching noise away from amplifier outputs.