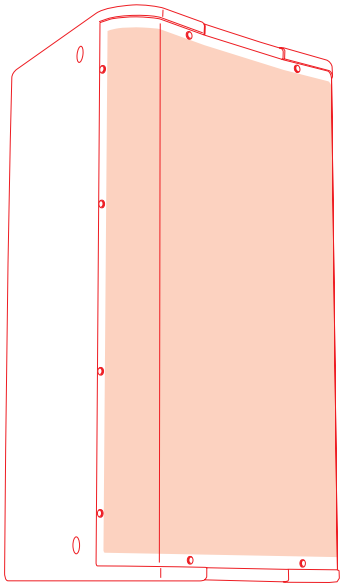
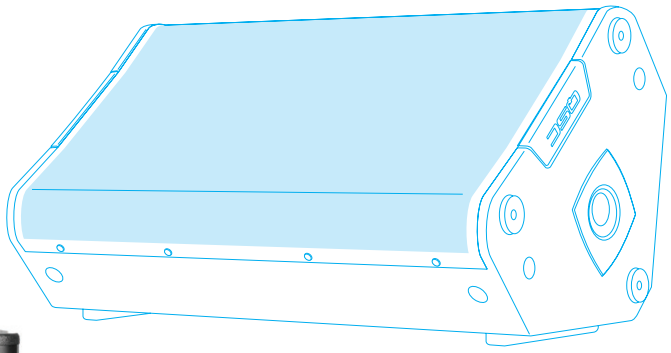
QSC

Application **Guide**

AcousticPerformance™ Series Loudspeakers





AET Application Engineering Team

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THE ACOUSTICPERFORMANCE™ SERIES. THE NAME SAYS IT.

The highly versatile AcousticPerformance Series comprises six models: three trapezoidal two-way models, a subwoofer, a two-way model that can be used equally well as a floor monitor wedge or as an upright high-power main loudspeaker, and a coaxial two-way model with 60- and 40-degree side angles for use as an upstage or downstage monitor.

All the two-way models are designed with Directivity Matched Transition (DMT™), in which the compression driver's waveguide is carefully designed so its coverage angle matches up with that of the woofer at the crossover transition. This results in smooth, coherent, and natural-sounding frequency response, even when the listener is off-axis.

All except the AP-212sw, AP-4122m, and AP-5122m are available in either black (RAL 9011) or white (RAL 9010). The AP-4122m and AP-5122m are available only in black RAL 9011.

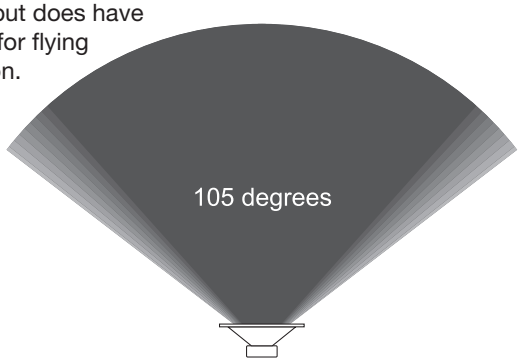
The AP models are well suited for high-quality systems, installed and mobile alike.

The model lineup

AP-5102

A 10-inch two-way loudspeaker with 105° coverage. It can be operated in either full-range passive mode (using the internal crossover) or active (bi-amped, with an active crossover). Bi-amped, the LF and HF drivers both have 8-ohm impedances. In full range, the system also has an 8-ohm impedance.

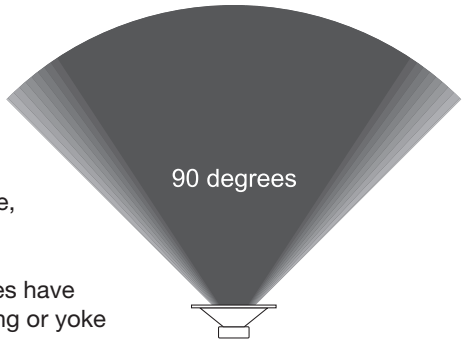
The trapezoidal enclosure has no handles but does have M10 threaded inserts that make it suitable for flying or yoke mounting in a permanent installation.



- HF: Compression driver with 76 mm (3 in) voice coil
- LF: 10 in driver with 76 mm (3 in) voice coil
- Max continuous SPL at 1m: 121 dB
- Recommended crossover: 950 Hz, 48 dB/oct slopes
- Intrinsic Correction™ available in select QSC processors

AP-5122

A 12-inch two-way loudspeaker with 90° coverage. It can be operated in either full-range passive mode (using the internal passive crossover) or active (bi-amped, with an active crossover). Bi-amped, the LF and HF drivers both have 8-ohm impedances. In full range, the system also has an 8-ohm impedance.



The trapezoidal enclosure has no handles but does have M10 threaded inserts that make it suitable for flying or yoke mounting in a permanent installation.

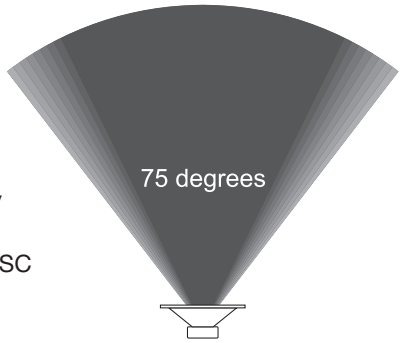
- HF: Compression driver with 76 mm (3 in) voice coil
- LF: 12 in driver with 76 mm (3 in) voice coil
- Max continuous SPL at 1m: 121 dB
- Recommended crossover: 950 Hz, 48 dB/oct slopes
- Intrinsic Correction™ available in select QSC processors

AP-5152

A 15-inch two-way loudspeaker with 75° coverage. It can be operated in either full-range passive mode (using the internal passive crossover) or active (bi-amped, with an active crossover). Bi-amped, the LF and HF drivers both have 8-ohm impedances. In full range, the system also has an 8-ohm impedance.

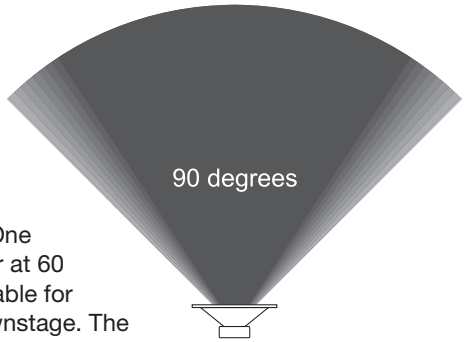
The trapezoidal enclosure has no handles but does have M10 threaded inserts that make it suitable for flying or yoke mounting in a permanent installation.

- HF: Compression driver with 76 mm (3 in) voice coil
- LF: 15 in driver with 76 mm (3 in) voice coil
- Max continuous SPL at 1m: 123 dB
- Recommended crossover: 950 Hz, 48 dB/oct slopes
- Intrinsic Correction™ available in select QSC processors



AP-4122m

A 12-inch two-way coaxial loudspeaker with 90° coverage. It has a 4-ohm impedance and can only be operated as a full-range loudspeaker with an internal passive crossover.



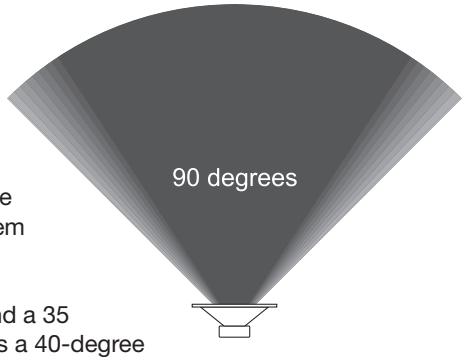
The enclosure has a handle on one end and a 35 mm pole socket on the other. One side is angled at 40 degrees and another at 60 degrees, so the loudspeaker is very suitable for stage monitoring, both upstage and downstage. The pole socket has Tilt-Direct™, which allows the user to mount the loudspeaker on a pole either straight upright or with a 7.5-degree downward tilt. The tilt is useful for directing sound from high pole-mounted loudspeakers down toward the audience instead of projecting it over them.

The low- and high-frequency drivers are coaxial to each other, so imaging is completely independent of the enclosure's orientation.

- Compression driver with 45 mm (1.75 in) voice coil, coaxial with 15 in driver with 76 mm (3 in) voice coil
- Max continuous SPL at 1m: 123 dB
- Recommended crossover: 950 Hz, 48 dB/oct slopes
- Intrinsic Correction™ available in select QSC processors

AP-5122m

A 12-inch two-way loudspeaker with 90° coverage. It can be operated in either full-range passive mode (using the internal passive crossover) or active (bi-amped, with an active crossover). Bi-amped, the LF and HF drivers both have 8-ohm impedances. In full range, the system also has an 8-ohm impedance.



The enclosure has a handle on one end and a 35 mm pole socket on the other. One side has a 40-degree angle with rubber rail feet, making it suitable for use as a floor monitor. The pole socket has Tilt-Direct™, which allows the user to mount the loudspeaker on a pole either straight upright or with a 7.5-degree downward tilt. The tilt is useful for directing sound from high pole-mounted loudspeakers down toward the audience instead of projecting it over them.

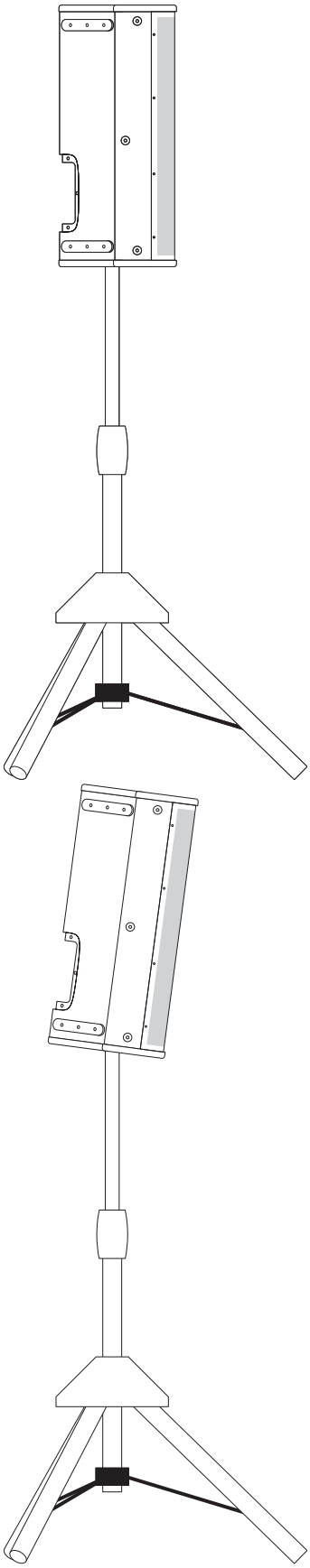
- HF: Compression driver with 76 mm (3 in) voice coil
- LF: 15 in driver with 76 mm (3 in) voice coil
- Max continuous SPL at 1m: 123 dB
- Recommended crossover: 950 Hz, 48 dB/oct slopes
- Intrinsic Correction™ available in select QSC processors

AP-212sw

A dual 12-inch subwoofer system, the AP-212sw is a versatile choice for adding deep bass response to a system. The total cone area of its dual 12-inch drivers is practically the same as that of a single 18-inch, yet the whole enclosure, when oriented horizontally, is only 15 inches high. So it fits easily under tables, risers, and many other forms of staging.

Even arranged horizontally, its width is only 26 inches, so even under the front of a riser or the apron of a stage you can tightly pack two or more together to get subwoofer array performance that is powerful and coherent over the entire subwoofer frequency range.

It has two M20 threaded inserts for mounting a pole, too, in either an upright or a horizontal position.



TiltDirect™ pole socket: 0° top; 7.5° bottom. Both the AP-4122m and AP-5122m have TiltDirect pole sockets.

Series features

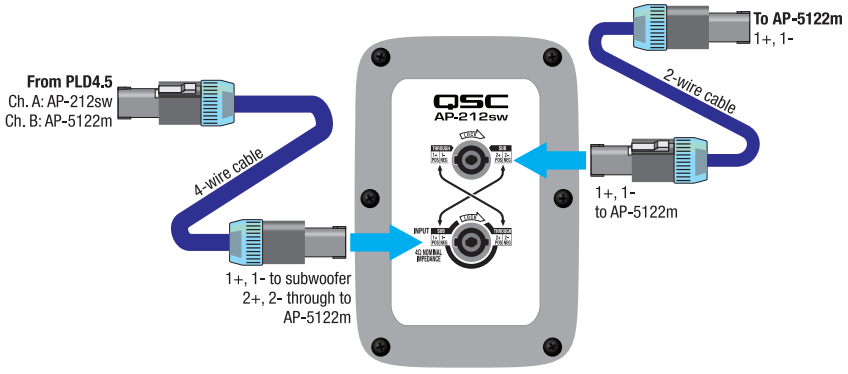
TiltDirect™

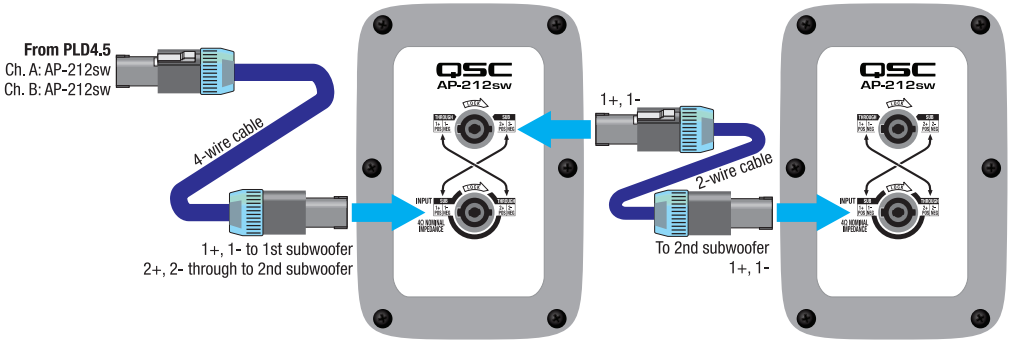
A loudspeaker on a stand is a common application for portable and temporary sound systems. All too often, though, the loudspeaker axis points over the heads of the audience.

To solve this problem, the AP-4122m and AP-5122m both have TiltDirect pole sockets that allow the loudspeaker cabinet to sit upright on a stand or tilt downward at a 7.5-degree angle to better cover an audience.

Dual NL4 connectors

The AP-212sw subwoofer system uses two Speakon NL4 connectors on the back panel. One is labeled INPUT and the other, Through. The pair are cross-wired; the input is wired to use 1+ and 1- to feed the subwoofer drivers, and 2+ and 2- to pass signal along to the Through connector, but the wiring is switched around so that the signal appears on 1+ and 1-. Therefore, you can use a four-wire loudspeaker cable from the amplifier to the first subwoofer carrying, say, subwoofer program material on one pair (1+ and 1-) and a full-range loudspeaker's program material into 2+ and 2-. Then, the full-range material comes out of the Through connector on 1+ and 1-, which makes it easy to send on to the loudspeakers via common two-wire cables using 1+ and 1-.





Accessories

M10 flying kit

The AP loudspeakers have M10 threaded attachment points for suspending or flying. QSC offer a kit of three M10×1.50×35–38 mm forged steel shoulder eye bolts, part number FG-000431-00. Shackles, cables, etc., are not included. Consult a licensed rigger or structural engineer for designing flown loudspeaker systems.

Subwoofer caster kit

A kit of 3-inch casters is available for the AP-212sw subwoofer.

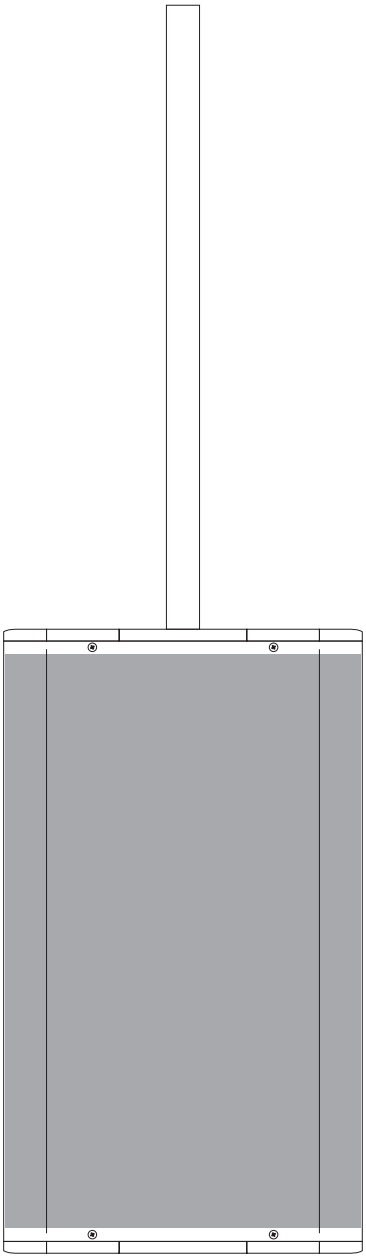
Accessory poles

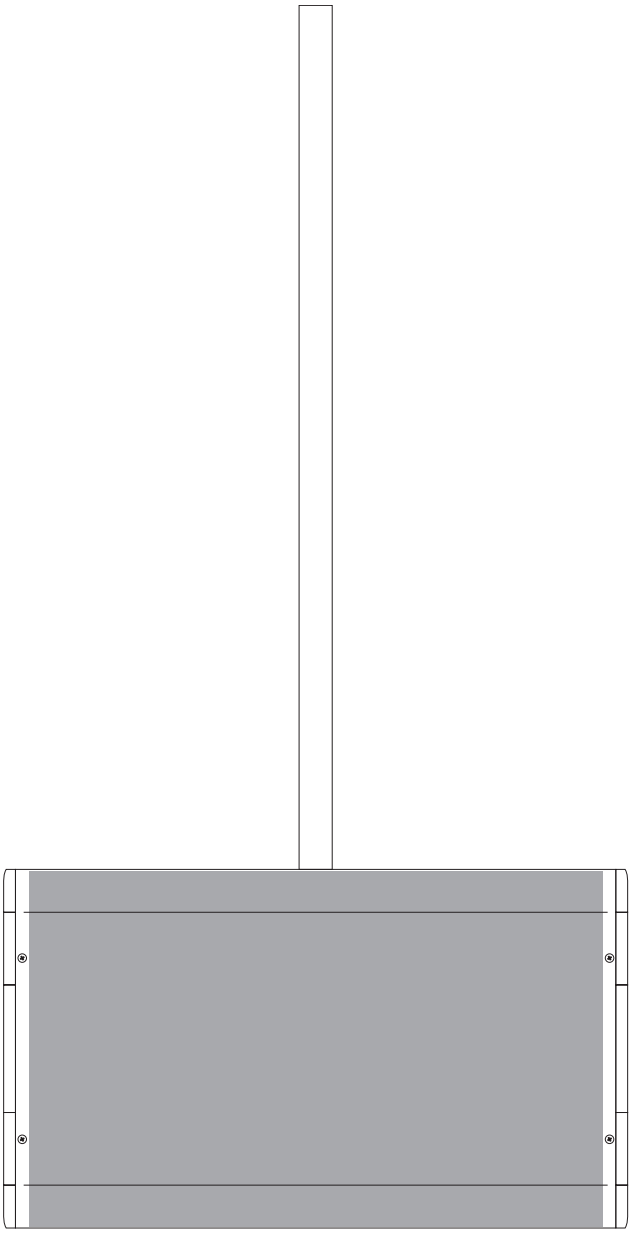
Two accessory poles are available to use with the AP-212sw subwoofer, and they support either the AP4122m or the AP5122m loudspeaker system. The subwoofer has two threaded M20 inserts to accommodate these poles. One is oriented for use with the subwoofer standing vertically and the other, for use with the subwoofer lying horizontally.

One accessory pole is 26.4 inches (670 mm) long, and is for use with the subwoofer either vertical or horizontal (below left), and the longer 36-inch (914 mm) pole is only for use with the subwoofer lying horizontally (below right).

The 26.4-inch pole is QSC part number CH-000960-00.

The 36-inch pole is QSC part number CH-001035-00.





Multiple subwoofers and “Power Alley”

Close packing

Some applications require more than one subwoofer, and that’s fine. Subs, because of the very long wavelengths of low-frequency sound, can array very easily. Which is usually good … but it can also present unexpected challenges.

The easy way to get the performance and mostly non-directional coverage of a single sub, only with more output, is to pack two or more of them together. Loudspeakers driven with the same program material that are less than a quarter wavelength apart will acoustically couple, meaning that their acoustic output will behave overall as if from one larger sub. The greater the ratio of the wavelength to their distance apart, the more nearly they behave as a single point source. The speed of sound (in dry air at 20°C and 1 atm pressure) is 343 meters (1126 ft) per second. A typical low-pass frequency for a subwoofer crossover is 100 Hz; a quarter-wavelength at 100 Hz is 858 mm, or 33.8 inches.

The width of the AP-212sw subwoofer when standing vertically is only about 380 mm, or 15 inches. So two AP subs standing vertically and close packed side-by-side are well within the dimensions of an acoustically coupled array, and the polar response of the pair will be nearly as even and omnidirectional as a single sub over the typical subwoofer frequency range.

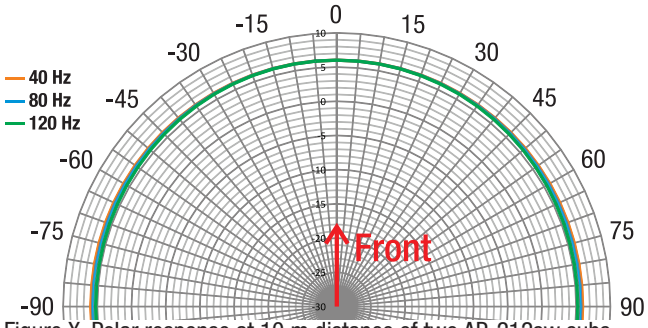


Figure X. Polar response at 10 m distance of two AP-212sw subs standing vertically, tightly packed side-by-side (380 mm spacing).

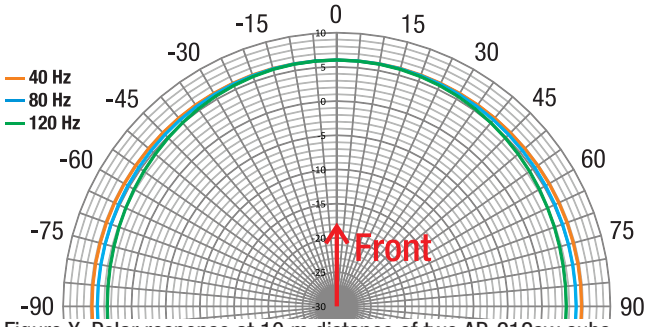


Figure X. Polar response at 10 m distance of two AP-212sw subs set horizontally, tightly packed side-by-side (660 mm spacing).

Even sitting horizontally, the AP-212sw sub is only 26 inches wide, so a close packed side-by-side array still maintains good non-directionality and coherence over the subwoofer range, with only slight narrowing of the polar pattern at the high end.

Separation

In some applications it’s impractical or impossible to place multiple subs together in a tight close packed array. For example, a popular arrangement is to place a subwoofer on each side of a stage. This is convenient, but it leads to a phenomenon often called “Power Alley.”

Because of the distance between the subs, they do not acoustically couple but act like two separated point sources. In certain directions, at certain distances, at certain frequencies, there may be a significant acoustical cancellation between the sound outputs of the two subs, causing nulls in the polar response. At all frequencies and distances, however, there will be a consistent lobe in the polar response in an axis perpendicular to the axis through the two subs. This perpendicular axis are all the points that are equidistant to both subs, and so there will be all reinforcement and no cancellation.

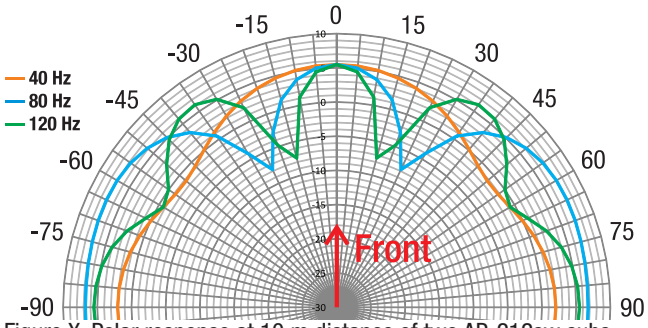


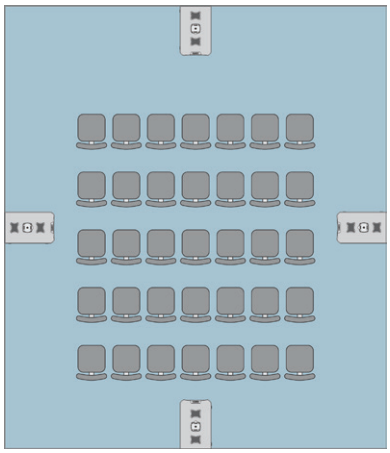
Figure X. Polar response at 10 m distance of two AP-212sw subs set 5 meters (16.4 ft) apart.

The result will be good, solid bass response along “Power Alley” and somewhat inconsistent bass response at various off-axis directions. The further apart the subs are, the more pronounced this effect will tend to be.

If the system is stereo it may be better to have the subs also in stereo *instead* of summing them to mono as is customarily done.

Rectangular rooms

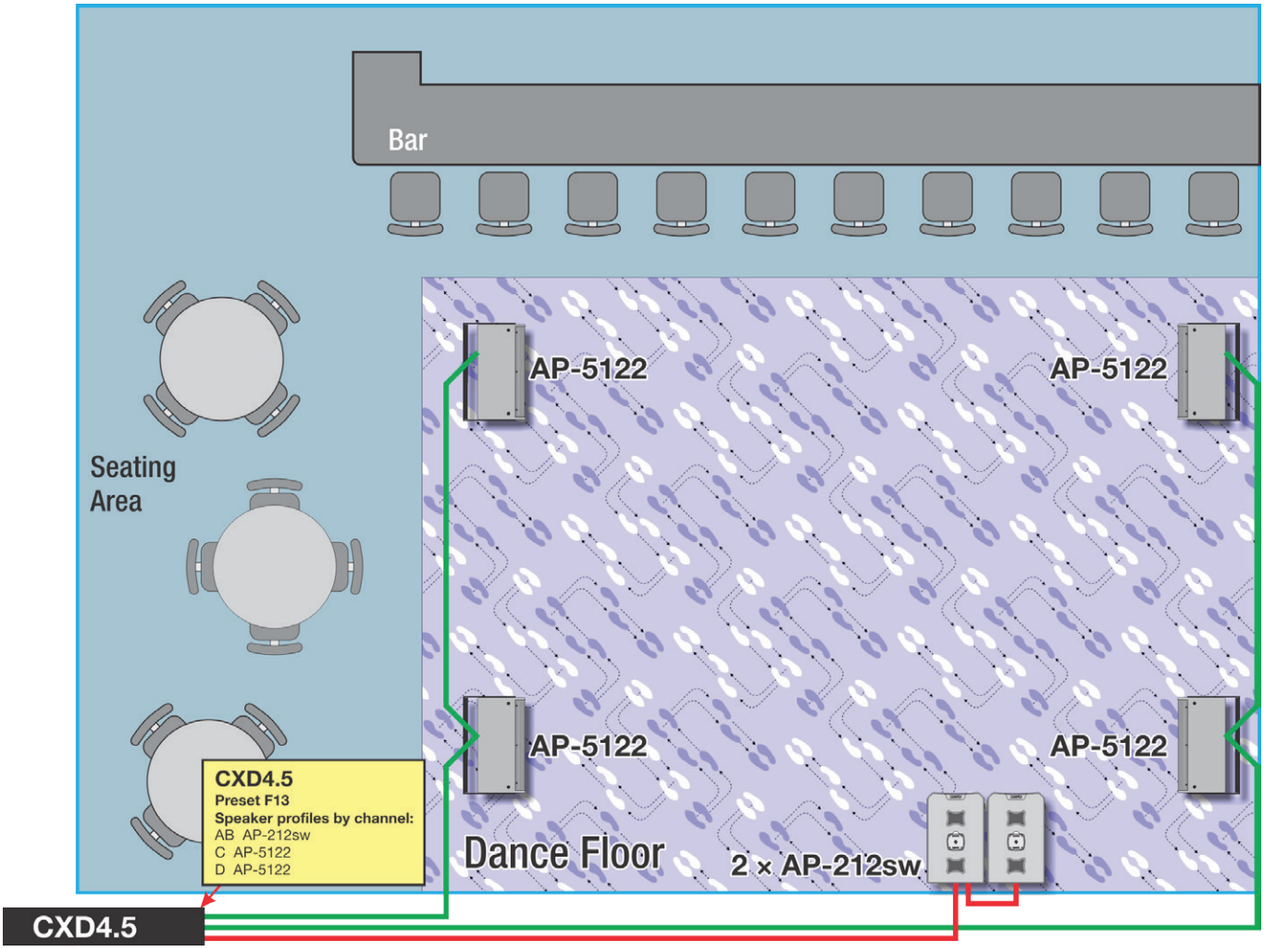
If you need to cover a rectangular room evenly with four (or multiples of four) identical subwoofers, consider placing them at the middle of each wall. Studies by Drs. Floyd Toole and Sean Olive have demonstrated that this approach yields the most uniform sound coverage and best mitigation of standing waves.



Application examples

Bar with dance floor

This first example is a bar with a dance floor. Obviously, they need a high-impact audio system to deliver music for the dancing patrons. Four yoke-mounted AP-4122m loudspeakers and a pair of AP-212sw subs fit the bill. They're all driven by a single QSC CXD4.5 amplifier, using preset F13 and loudspeaker profiles selected to exactly match the choice of loudspeakers and subs.

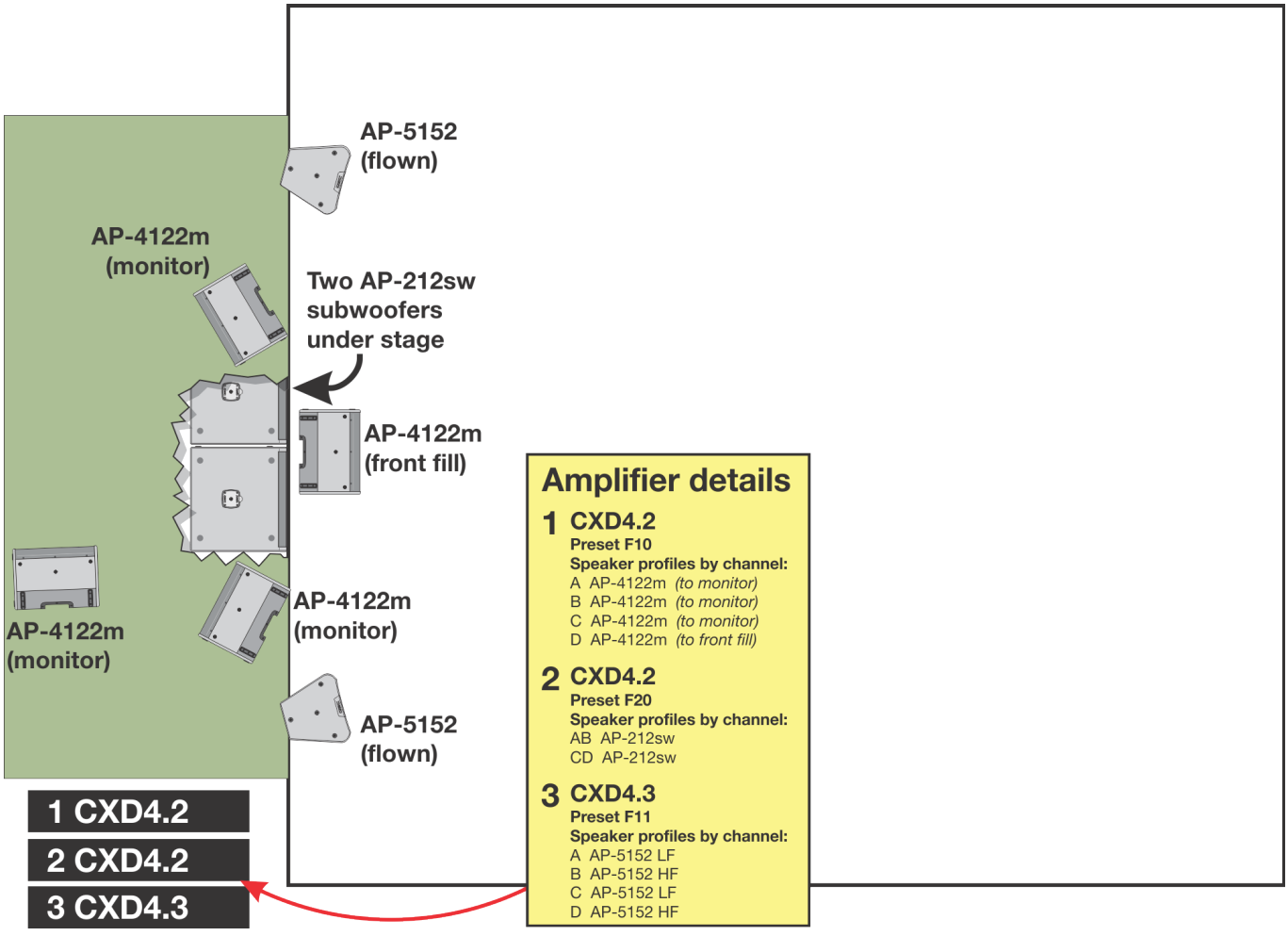


Music club

The next example is a music club with a compact stage area looking out over the audience. The main left and right loudspeakers are a pair of AP-5152 boxes, flown from suitable rigging points in the ceiling. A pair of AP-212sw subwoofers are clustered together just under the apron of the stage. For patrons who are up close in the center, an AP-4122m serves as a center fill.

For the musical acts, three AP-4122m loudspeakers will service as monitor wedges; their size make very efficient use of the available space on the stage.

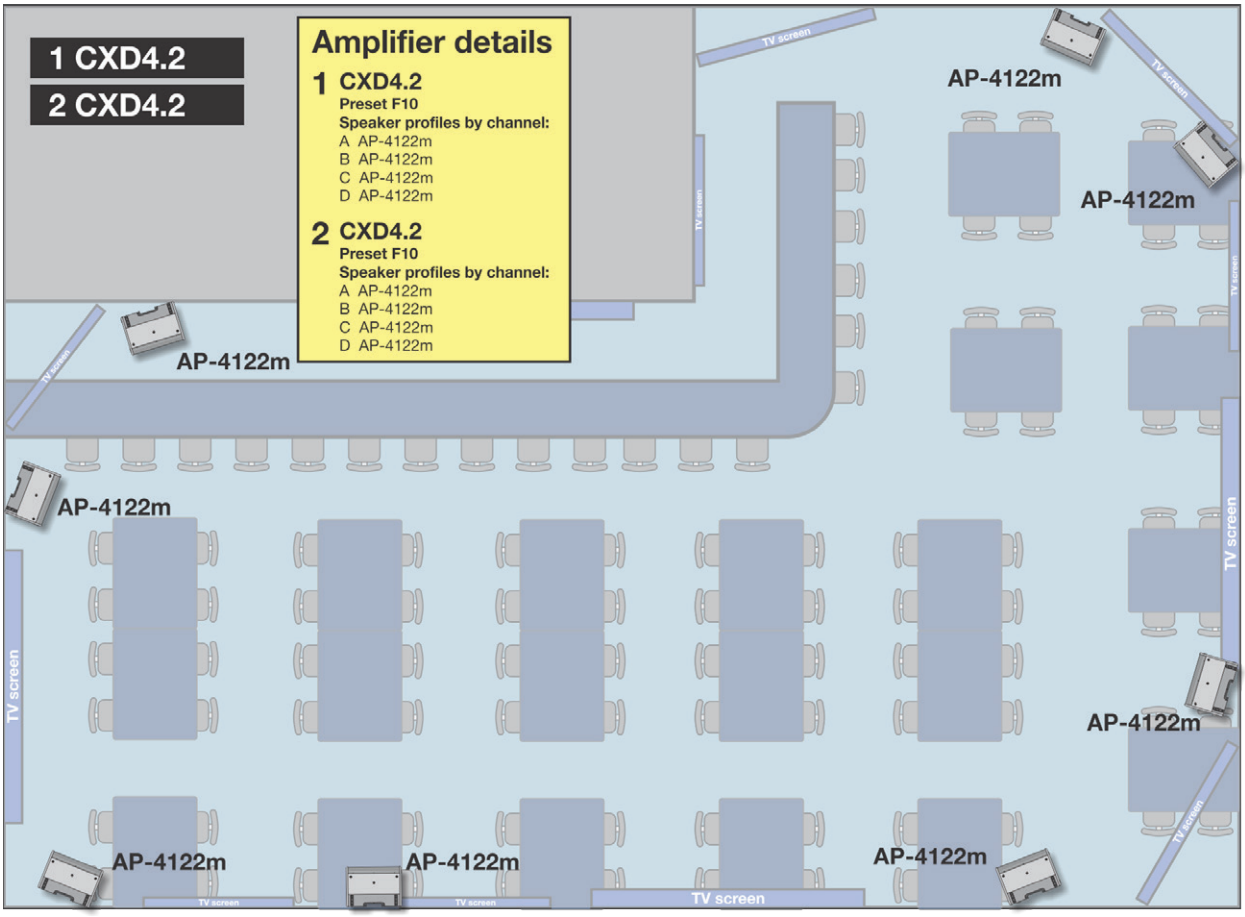
They're all powerd by two QSC CXD4.2 and one CXD4.3 amplifer. See the floor diagram below for details on the presets and loudspeaker profiles selected.



Sports bar /restaurant

A key feature of any sports bar is an abundance of TV screens. This sports bar has screens of various sizes mounted to the surrounding walls. For audio, the operator opts for eight zones spread around the perimeter of the venue, Each zone is an AP-4122m, whose coaxial construction is ideal for localization.

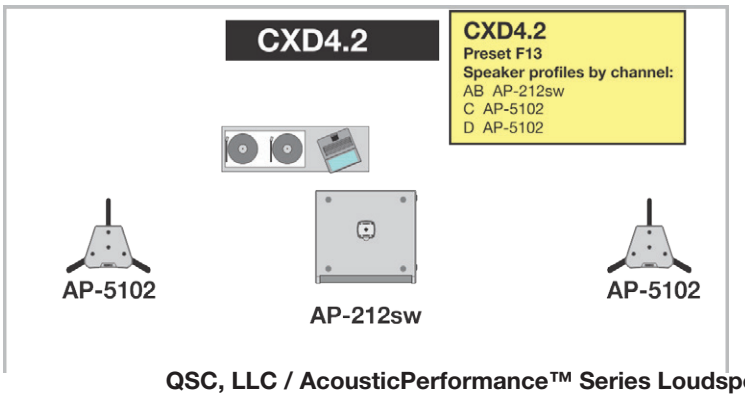
The zones can be apportioned as needed to whatever sporting events are being displayed. To suit this application, the eight zones are powered by two four-channel CXD4.2 amps. The amps are initially configured using factory preset F10, and then their various internal matrix mixer settings for different zone arrangements are included in the user presets stored in them. As a result, the whole place can be reconfigured in seconds. The AP-4122m speaker profiles selected in the amps are perfect for great voicing and loudspeaker protection.



Mobile entertainer

This mobile entertainer opts for high audio performance with a pair or AP-5102 loudspeakers on tripod stands and a single AP-212sw subwoofer.

A CXD4.2 powers them. With the AP-212sw and AP-5102 speaker profiles selected, the amp can make the loudspeakers sound their best and also protect them against common operator errors, such as overpowering.



Series specifications

	AP-4122m	AP-5102	AP-5122	AP-5122m	AP-5152
Frequency response (-10 dB)	55 Hz–20 kHz	60 Hz–20 kHz	48 Hz–18 kHz	55 Hz–18 kHz	44 Hz–18 kHz
Rated noise power/voltage	325 W / 36 V rms	450 W / 54 V rms	550 W / 60 V rms	550 W / 60 V rms	625 W / 65 V rms
Impedance	4Ω	8Ω	8Ω	8Ω	8Ω
Sensitivity @ 1 m	96 dB (2 V rms)	94 dB (2.83 V rms)	95 dB (2.83 V rms)	95 dB (2.83 V rms)	96 dB (2.83 V rms)
Coverage	90° conical, DMT	105° conical, DMT	90° conical, DMT	90° conical, DMT	75° conical, DMT
Peak SPL @ 1 m	127 dB	127 dB	128 dB	128 dB	129 dB
LF Driver	305 mm (12 in) with 64 mm (2.5 in) voice coil	254 mm (10 in) with 76 mm (3 in) voice coil 450 W / 54 V (2 hr)	305 mm (12 in) with 102 mm (4 in) voice coil 550 W / 60 V (2 hr)	305 mm (12 in) with 102 mm (4 in) voice coil 550 W / 60 V (2 hr)	381 mm (15 in) with 102 mm (4 in) voice coil 625 V / 65 V (2 hr)
HF driver	compression driver with 45 mm (1.75 in) voice coil	compression driver with 76 mm (3 in) voice coil 72 W / 24 V (2 hr)	compression driver with 76 mm (3 in) voice coil 72 W / 24 V (2 hr)	compression driver with 76 mm (3 in) voice coil 72 W / 24 V (2 hr)	compression driver with 76 mm (3 in) voice coil 72 W / 24 V (2 hr)
Input connectors	Two NL4	Barrier strip, NL4	Barrier strip, NL4	Barrier strip, NL4	Barrier strip, NL4
Enclosure	15-ply Baltic birch plywood				
Net weight	39.7 lb / 18.1 kg	48 lb / 21.7 kg	65 lb / 29.5 kg	65 lb / 29.5 kg	80 lb / 36.2 kg

	AP-212sw
Frequency response (-10 dB)	35 Hz–250 Hz
Rated noise power/ voltage	600 W / 49 V rms
Impedance	4Ω
Sensitivity @ 1 m	93 dB (2 V rms)
Peak SPL @ 1 m	128 dB
LF Driver	Two 305 mm (12 in) with 64 mm (2.5 in) voice coil
Input connectors	Two NL4 crossed: A: Sub 1+ / 1-; Thru 2+ / 2- B: Thru 1+ / 1-; Sub 2+ / 2-
Enclosure	15-ply Baltic birch plywood
Net weight	65.4 lb / 30.4 kg

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