

# SOUND SYSTEM RECOMMENDATIONS

I frequently get requests for recommendations on purchasing a mobile sound system for social tango dance events. The advice here will apply to just about any social dance group needing a mobile sound system. Please note that permanent installations have their own set of challenges that are beyond the scope of this paper.

First off, you want professional sound equipment, not home sound equipment. Some of the reasons:

- Home equipment is not engineered to withstand all the stress of moving frequently
- Home equipment typically uses unbalanced connections – pro equipment uses balanced connections
- Home speakers typically have face-mounted tweeters that disperse sound over a wide area, whereas pro speakers have horn-loaded tweeters to project the highly-directional high frequencies out into the room
- Home equipment is not engineered to handle high power for long periods of time without distortion

Speakers are the most difficult thing to design in the entire sound re-production audio chain, and therefore the most critical and important piece of gear. Characteristics of a good, full-range speaker:

- Frequency range 45-20,000 Hz -10db
- Frequency response 55-16,000+ Hz +/- 3db
- Flat frequency response curve
- Maximum sound pressure level (SPL) at least 110 db @ 1 meter
- Peak power handling at least 50% higher than “program” or “music” rating
- Horn-loaded tweeter
- As small, light, and durable as possible for easy transport
- Overload protection
- \*Excellent transient response/low distortion

Note that I do not specify anything about the type or specifications of the crossover – this is best left to the manufacturers. The quality of the crossover will be reflected in the rest of the specifications and listening tests.

\* All of these characteristics may be found in manufacturer’s literature, except transient response/low distortion. A speaker with good transient response is able to quickly recover from re-producing one musical signal to the next. If the speaker doesn’t have adequate transient response, you will hear a distorted signal that will sound smeared. That speaker will not sound as clear and precise as a better speaker. How will you find this out? You MUST listen to the speakers! What you will find is that the speakers that sound the best cost the most, period.

I recommend doing some internet research to familiarize yourself with the choices, then visiting local pro sound shops to listen and discover the real impact of the specifications. If you’re new to this, it will take time to “tune” your ears to understand what impact the specifications have. Be sure that you’re listening to the speakers in the same room with as many variables consistent between speakers – speakers are VERY sensitive to their position within a room. Companies who make quality professional speakers that continually top my list of choices include EV, JBL Pro, & Mackie. I’ve used a set of Mackie C300 speakers for several years with outstanding results.

A note about SPL: Social dance events don’t demand loud volume levels, but it is never wise to operate equipment at its absolute limits for long periods of time. You want to run the equipment at between 50-75% of its specified maximum SPL to avoid distortion, strain, and to ensure long life for your equipment. Also, the SPL specifications are for a listener positioned directly in front of the speaker 1 meter away – most of the time, we’re much further away from the speaker than that.

For large rooms and large groups of people, consider the use of one or more sub-woofers and the use of 4 “satellite” speakers. The subwoofer should go down to 40 Hz or below at a minimum of 110 SPL. When using subwoofers, the requirement for the “satellite” speakers to re-produce frequencies below 80 Hz is removed. Therefore, these speakers can be much smaller while maintaining excellent sound quality.

Next, get speaker stands for each full-range speaker, capable of going up to 9’. When you set the full-range speakers on the stands, get the horn of the speaker at least 9’ above the floor – the higher the better. The high frequencies that come out of the horn are the ones that hurt your ears, so you DO NOT want the horns at or near ear-level.

Finally, I highly recommend speaker bags for the full-range speakers to allow for easy handling and protection of your equipment.

Amplifiers take the signal from the CD player or computer and make it louder. In the best case, that's all they do. In the worst case, they introduce distortion and limit useful frequencies from getting to the speakers. Many speakers are available with amplifiers built-in. The advantage is that the amp is perfectly matched to the speaker and the result is excellent sound quality and one less component to worry about setting up. However, this also means that you need to run both power and audio signal cables to the speakers. Running power from multiple sources may introduce a ground-loop hum or buzz. In addition, the amplifiers make the speakers noticeably heavier. For me, all this is a hassle, and thus I prefer un-powered speakers with separate amp(s).

Characteristics of a good amplifier:

- Frequency response from 20-20,000 Hz at less than 0.1% total harmonic distortion (THD)
- \*Power handling based on minimum speaker requirement at speaker's rated impedance
- Signal to noise ratio better than -100 db (i.e. -90 db is worse than -100 db)
- Clipping, thermal, and over-current protection
- Ability to handle at least 4-ohm loads (typical when 2 speakers are "daisy-chained" together)
- \*\*Excellent transient and dynamic response
- As light and small as possible
- An optional, but very useful feature, is a subharmonic filter, usually set to block frequencies below ~ 35 Hz.

\* The single most important specification for amplifiers is their power-handling, and this is very misunderstood, although it is quite simple to explain. Most pro speakers list 3 power-handling capabilities: "rms or continuous", "program or music", and "maximum or peak". It is best to get an amp that can produce at least as much as the program or peak rated power of the speaker. The reason is that if you match a low power amp up to a speaker that requires high power, the amp will always be working at or near its limit, and thus will likely be sending a distorted signal to the speaker. This is bad because the sound will be distorted, but even worse, distorted signals are extremely difficult for speakers to handle, and thus this is the most common source of speaker blow-outs.

However, if you're very careful, understand this, and have a speaker with high power handling relative to the amp, but don't ever need to approach the speaker's limits, you can specify an amplifier with power handling equal to the "rms or continuous" rating of the speaker. I've been doing this, carefully, for several years now with excellent results. However, if I had to do it again, I would have purchased a more powerful amp – the difference in cost is not at all worth the worry!

\*\* Again, transient response and dynamics must be heard – although this is not nearly as important as with speakers because most quality pro amps have adequate capabilities here. Two companies that consistently make quality amps that I recommend are QSC and Crown. I am a huge fan of QSC PLX2 series amplifiers.

Other equipment:

If you use CDs, get a simple, professional dual CD player. You'll also need a professional mixer with at least 2 channels and a clear layout so the volume sliders or knobs are easy to get to in a pinch. If you use a computer, you can connect it directly to the amp, as long as the amp has "gain" controls to control the volume. Get a professional sound card for the laptop.

Equalizers can be handy, but only in the hands of an experienced sound technician. Otherwise, don't bother.

Cables: The connection between amplifier and speaker is the most critical – here balanced cables are mandatory. The cables should be 16-gauge or larger, with (in order of preference), Speakon, XLR, or ¼" TRS ends, depending on your equipment. Note that cables are expensive, and be prepared to spend \$100 or more!

Armed with the above information, go to a good, well-established pro audio shop (with a tango CD in hand!) and get set up with the appropriate equipment. The advice of a knowledgeable sound technician is invaluable in matching the equipment to your particular needs. Otherwise, there are many on-line shops such as [www.planetdj.com](http://www.planetdj.com), [www.musiciansfriend.com](http://www.musiciansfriend.com), [www.guitarcenter.com](http://www.guitarcenter.com), and more.

Happy listening!

Dan