



TechTalk

Topic: 70 Volt Sound Systems

Application: Overview - 70 Volt Systems easy as A B C & D





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The basic components of a 70-volt system are (A) an audio source, (B) a 70 volt amplifier, (**Never hook up 70 volt speakers to a residential 8 ohm amplifier. Stuff could blow up!**) (C) speaker wire (usually 16/2 gauge for runs up to 1,000 feet) and (D) speakers with transformers capable of receiving a 70 volt signal.

Where would you use a 70-volt system?

Any commercial location that requires more than one pair of speakers.

Any commercial location that does not want a stereo signal because of speaker placement or seating arrangements.

A distributed home audio system that does not want stereo.

Why 70 volt and not 8 ohm?

A 70-volt system allows you to use multiple speakers without worrying about impedance issues, which can overload and damage an 8-ohm amplifier.

A 70-volt system allows you to run more speakers off a single amplifier.

A 70-volt system plays in mono, not stereo, so speaker placement is not as critical.

A 70-volt system allows you to daisy chain speakers together, running the wire from one speaker to the next as opposed to home runs back to the amplifier for each 8-ohm speaker.

A 70-volt system allows you to adjust the wattage taps on each speaker so that you can set the volume of each speaker.

A 70-volt system gives you flexibility in how many speakers you can run off a single amplifier by adjusting the wattage at each speaker.

Why use 8 ohm at all?

70-volt systems are monaural only. They cannot play a stereo signal.

Typically 70-volt systems do not have as broad a frequency response as an 8-ohm home audio system.



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Figure A

For a lot of us, a picture's a great place to start. Looking at a speaker for use in a 70 volt system, you'll notice an obvious difference from the familiar 8ohm variety, it's either got a transformer with a bunch of wires coming out of it (figure A) or a dial selector, usually next to the + / - terminals (figure B).



Figure B

These are for the various wattage taps that you can set the speaker up to draw. For example these taps may be labeled as 1.25, 2.5, 5 & 10 watts. In a constant voltage system (25/70/100V), the tap you choose will determine the power (and how loud) that individual speaker can play. You often mix speakers set to different wattage taps in a system so that some areas can play louder than others. An example would be at a quite reception area versus a warehouse with a high ceiling. The speakers in the warehouse might all be set to 10 watts versus maybe only 1.5 in reception. More on that in a bit.

After all your connections are made plug the AC power cord in

Connect a transformer coupled 70V speaker to the C and 70V terminals



Connecting a single speaker with a 70V transformer to the output terminal of a 70V amplifier is relatively straight forward. Wire the negative (-) to the "C" common output terminal and the positive (+) to the 70V output terminal. Remember, there is no left or right with 70 volt systems, so the amp typically as only this one Common & 70V output terminal.(See figure C)

Never connect a 4ohm or 8ohm speaker directly to the 70V output terminal. Always insure the speaker is coupled to a 70V transformer.

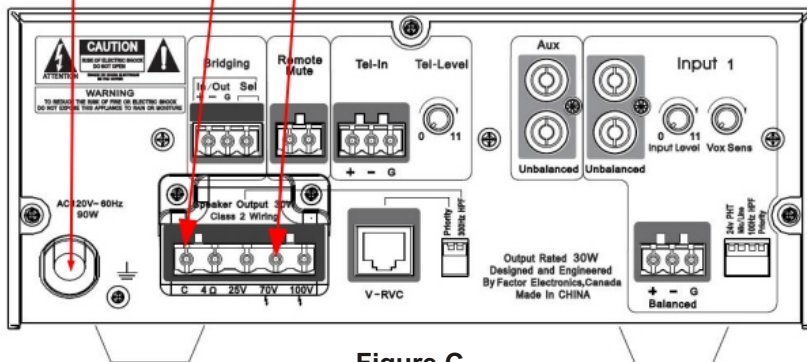


Figure C

Additional speakers are added by connecting them in parallel, from one to the next. This is done by connecting the speaker wire from the negative (-) of speaker #1 on to the negative (-) of speaker #2. The positive (+) from speaker #1 is connected to positive (+) on speaker #2. Additional speakers are added the same way (see figure D)



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So how do you know what taps and what amplifier you need - Easy! First determine what kind of sound quality and SPL (Sound Pressure Level (Loudness)) your customer is looking for. Typically you want to set your speaker level 3dB higher than the ambient background noise level. This can be done using an inexpensive hand-held SPL meter (figure E).

For example, if your customer is a dentist and only wants soothing background music, then you will not need too many speakers and they won't need to be playing very loud. This means low SPL and low wattage taps on the speakers. This probably also would mean a low wattage amplifier. However, if your customer is a restaurateur with a busy restaurant and a hopping bar during happy hour, then you will probably need more speakers for better fill as well as higher wattage taps for higher SPL and a beefier amplifier to drive all this stuff. And assuming the customer has a budget, this all needs to fit into it.

Virtually all 70-volt systems have the same component groups. First, you need an audio source, such as an XM radio receiver. Next you will need an amplifier, but before you go and buy the cheapest lowest wattage amp you can find, you need to know how many speakers you will need and what type of SPL your customer is looking for, especially during peak hours for restaurants and retail stores. You will also obviously need speaker wire and speakers.

As a general rule of thumb, the more speakers you use, the smoother the coverage will be. No matter what brand of speaker you choose and regardless of some speakers marketing hype, more speakers mean a smoother, more seamless sound, which is a good thing. However convincing your customer of this is not always easy. But keep in mind that I have never met a customer who complained about his audio system sounding too good.

Once we know how many speakers we will need and about how loud they will need to play, we can determine the power needed from our amplifier. For example, if we are using 10 speakers and tapping each one at 5 watts, then we would need a 50-watt amplifier right? No. You should always allow for about 20% "head room" or extra power to handle any unusual amp requirements such as a deep bass note or a booming finale. So with our requirements of 10 speakers tapped at 5 watts our amplifier should be rated for.....60 watts! And with this rule of thumb, more headroom is better than less.

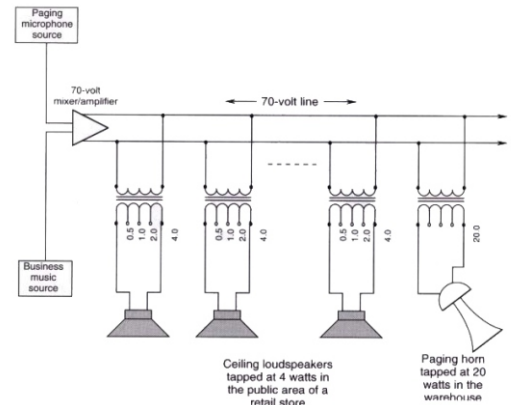


Figure D



Figure E



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Unless you are doing more than one zone, you simply run a single pair of 16/2 wire from the amplifier to the first speaker. Make sure that the wire is UL Listed and Plenum Rated if it's running above ceiling tiles in the cold air return. **Note: 16/2 is an adequate gauge of wire for up to 1000' runs.**

As previously mentioned, for multiple speakers, you are going to daisy chain the speakers together which means that you are going to run the wire from one speaker to the next, in parallel and observing polarity, until you have all the speakers wired together. Repeat this process until all the speakers have been wired. Make sure all of your wire connections are securely tightened. Do not feed any wire out of the last speaker. Remember to set the wattage tap on each speaker before you move on. It will save you time later.

Here's an example simple system for a restaurant with paging and background music. In this example we'll have a total of 13 speakers on the one mixer-amplifier, three outdoor cabinets at 30 watts, six more in-ceiling speakers at 10 watts and an additional four in-ceilings set at 5 watts each. (figure F)

The simple math is this:

6 x 10 watts = 60 watts

3 x 30 watts = 90 watts

4 x 5 watts = 20 watts

Total required power = 170 watts

Using our 20% headroom rule, we'll choose an amplifier with at least 204 watts output.

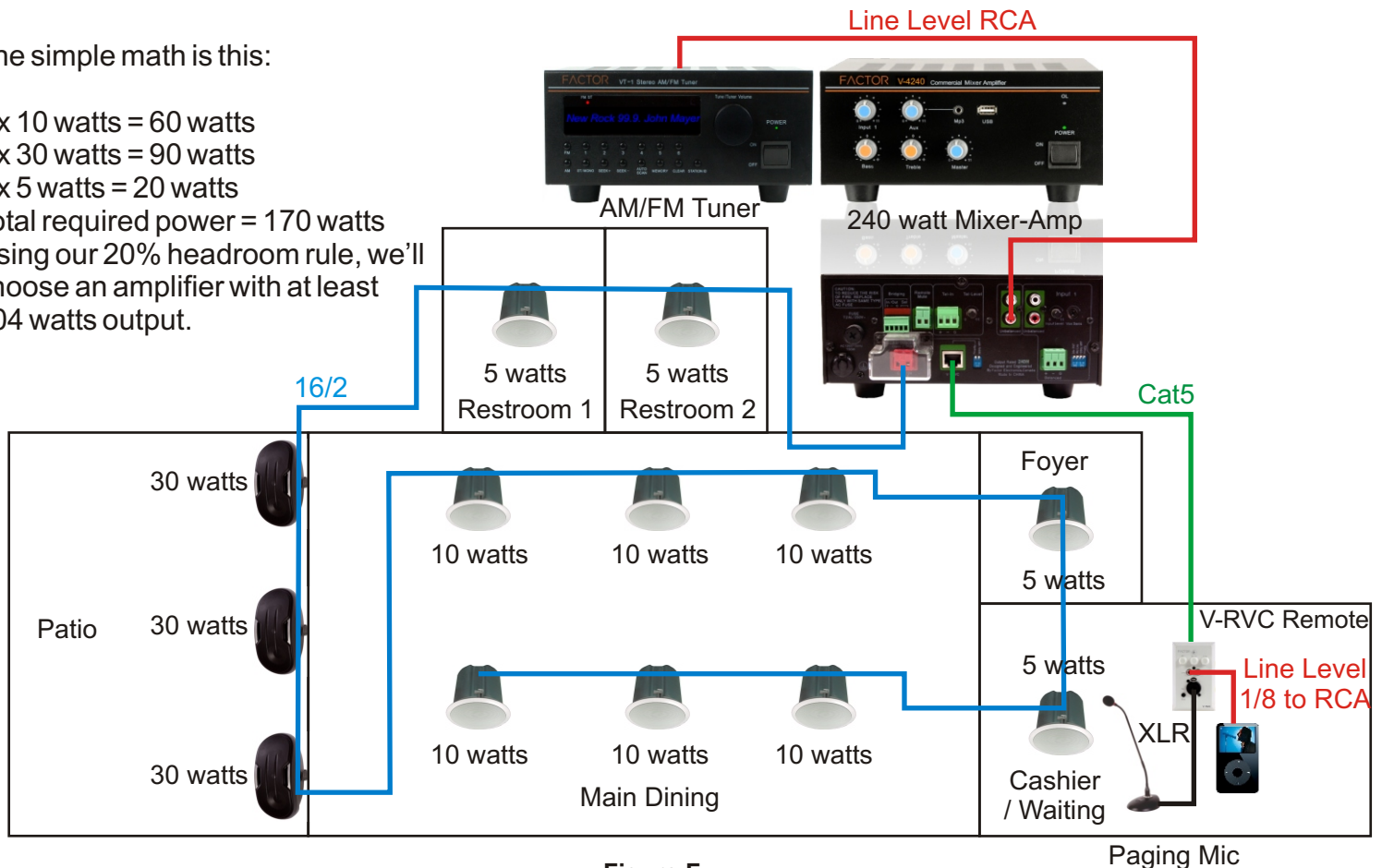


Figure F

Paging Mic



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You have your source and your amplifier set up in a place that is secure if possible, your speakers installed and wired and your wattage taps set to your estimates. Now you need to turn the system on and see how it sounds. If you need to make a few minor adjustments to the wattage taps on the speakers, now is the time to do it. For example, you may not want the speaker over the cash register playing as loud as the ones in the dining area.

Once you are satisfied with the performance of the entire system, go over all the operational information with the customer and any of his or her staff that may need to know about the source and the amplifier.

There! You have successfully installed a commercial 70-volt system for a very happy client. With luck he or she will give you referrals and hopefully you can use this client as a reference. One note of caution when installing ceiling speakers, make sure that you know the exact size of the cut out needed for the speaker. It is very hard to cover mistakes in dry wall and even more so in a drop tile ceiling that has been painted a unique color and then topped off with ten years of restaurant grease coating it. Also, thoroughly read all instruction manuals for your source, amplifier and speakers. No guessing!

It is always a good idea to come back when the system is in operation during actual business hours to check and make sure it is performing as anticipated by the customer.