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Multiple Speaker Hookup

MULTIPLE SPEAKER HOOKUP In a multiple speaker hookup, it is necessary to consider impedance. This is the electrical resistance of the voice coils of the speakers. The lower the impedance, the more electrical energy is applied to the speakers. This is why specifications on power amplifiers will show a given power rating into an 8-ohm load, and a considerably higher power input into a 4-ohm load.

If a loudspeaker were 100% efficient, all of the electrical energy delivered to it by the amplifier would be converted into sound energy. Unfortunately, speakers are not 100% efficient; in fact even the highest quality speakers in the best designed enclosures are not more than 25% efficient. The electrical energy which is not converted into sound by a speaker is converted onto another form of energy--heat. This heat must be dissipated at two points: the voice coil of the speaker, and at the amplifier. Excessive heat at either point can cause damage to the sound system.

The minimum impedance load for a Hilton amplifier is 4-ohms per channel, for best operating results. Any speaker hookup that is 4-ohms, or higher, will not cause a problem with your sound system **but** you will have a loss of power converted to sound as the total impedance increases.

The hookup diagrams, in section 9 - "Diagrams", show correct use of the series Y connectors for hookup of 2, 4, 6, and 8 speakers, to obtain equal volume level from each speaker and maintain proper net impedance. If it should be necessary to connect 5 or 7 speakers, a slave amplifier should be used. It is impossible to get equal volume from these combinations with a single amplifier, unless you connect all of them in series; this hookup is not recommended.

If you must use a speaker hookup not shown in these diagrams, or if you plan multiple hookup of speakers not manufactured by Hilton, the following points must be considered:

1. You must use a hookup which will produce a net impedance load of 4-ohms or higher to one amplifier channel.
2. The net impedance to each leg of a series Y connector should be the same, or the speakers driven by one leg will receive more energy and therefore produce more volume than those driven by the other leg.
3. Different makes and types of speakers have different degrees of efficiency and will produce different sound volumes when driven at the same amplifier output level. Mixing different types of speakers is not recommended, but if you must do so, use the more efficient speakers nearest the center to cover the main portion of the floor, and the less efficient ones at the ends to cover the two front corners of the floor.

HOW TO DETERMINE NET IMPEDANCE

To determine the net impedance of a given combination of speakers, it is necessary to understand and apply the following:

IMPEDANCE: The resistance produced by the voice coil of a speaker, expressed in ohms. As an example Hilton "Workshopper" speakers are 8-ohms, the PS-10 and LB-1 are 4-ohms; other makes have varying impedance's, usually from 4 to 16 ohms.

PARALLEL CONNECTION: A hookup in which the output of the amplifier is divided among speakers, with part of the output going to each speaker. As an example the 2 speaker jacks on each channel of a Hilton system are connected in parallel. Connecting speakers in parallel decreases the net impedance.

SERIES CONNECTION: A hookup in which all of the amplifier output passes through each speaker in turn, instead of being divided up among them. If you plug a series Y connector into the amplifier and connect one speaker to each leg, you have the speakers connected in series. Connecting speakers in series increases the net impedance.

SERIES-PARALLEL CONNECTION: If you have two groups of speakers which are connected in parallel within the group, and connect one group to each leg of a series Y connector, you have a series-parallel connection. Series-parallel hook ups are used to get the correct, or optimal,

speaker impedance for a given multi-speaker hook up.

NET IMPEDANCE -- The combined impedance of all speakers in a hookup:

IN PARALLEL -- the impedance of 1 speaker, divided by the number of speakers in the parallel hookup. This assumes that each of the speakers in the hookup have the same impedance.

IN SERIES -- the impedance of 1 speaker, multiplied by the number of speakers in the series hookup. This assumes that each of the speakers in the hookup have the same impedance.

IN SERIES-PARALLEL -- the net impedance of each parallel group, multiplied by the number of parallel groups connected in series. This assumes that each group in the hookup is the same impedance.

CONNECTING SPEAKERS OTHER THAN HILTON SPEAKERS

Any **one** speaker with the impedance of 4-ohms or higher can be connected directly to a Hilton amplifier.

Before connecting two speakers to the same channel, first find out their impedance, if possible. If they are 8-ohms or higher, connect them in parallel. Two 4-ohm speakers must be connected in series. For other combinations, follow the instructions given above to obtain a net impedance of 4-ohms or higher.

CHECK THE POWER RATING OF THE SPEAKER AND BE CAREFUL NOT TO EXCEED IT. Overdriving of a speaker with a low power rating can result in any of the following: 1. Distortion of the program. 2. Voice coil may become jammed at one end of its excursion, making the speaker inoperative. 3. A short circuit may occur in the voice coil, ruining the speaker and possibly causing damage to your sound system.

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