

Passive Preamps

Passive preamps have gained popularity in high-end audio circles. Provided that a high quality volume control is used, a passive preamp is often the easiest and cheapest way to reach high-end sound quality. Actually, the term "passive preamp" is slightly misleading. The word preamp or preamplifier is not supposed to be a passive device, as a passive device may not provide amplification. So a better term than passive preamp would be passive volume control.

DACT stepped attenuators are high quality volume controls and therefore also well suited as passive volume controls in audio systems.

A passive volume control is a passive device (no active electronics and therefore no power supply required) that replaces the traditional preamplifier. Today, many signal sources such as CD players have sufficient output level to drive most power amplifiers directly. It means that no additional amplification is required, so for level purposes there is no need for a preamplifier. With a passive volume control in between, the signal from the source may be fed directly to the power amplifier. One other component you may wish is an input selector like for instance DACT's CT3-5-4.

There are some significant advantages using a passive volume control:

- * Cost savings. A very high quality passive volume control is cheaper than even low quality preamplifiers.
- * Improved sound quality. The non-linearities, noise and distortion from the preamplifier are avoided. Even the most expensive preamplifiers add coloration and distortion to the sound.

In many cases, a passive preamplifier sounds as good or better than the best active preamplifiers. In other cases, it is our experience that a good line stage following the volume control may sound more dynamic than a passive volume control. It seems to depend on many different circumstances, which solution is the better. For instance, the type and length of cable connected to the output of a passive volume control is critical. For those interested in comparing between a passive volume control and a buffered volume control, DACT offers the CT101 buffer/line stage for buffering DACT attenuators.

An active preamplifier usually has high input impedance and low output impedance. This fact makes the choice of interconnect cables relatively uncritical.

When the preamplifier is replaced by a passive volume control, the situation is different. The input impedance of a passive volume control is usually not as high as that of a power amplifier and the output impedance is usually high compared to a preamplifier's output impedance.

If care is taken in dealing with this issue it is not a problem in most Hi-Fi systems. The most important matter is to take care of the impedance of the

interconnect cables. The output impedance of the source (for instance a CD player) is usually relatively low. Therefore, the interconnect cables between the source and the passive volume control are not as critical as the interconnect cables between the passive volume control and the power amplifier. The key factor to look out for is the loading capacitance on the volume control's output. In order to maintain a large bandwidth, the loading capacitance should be as small as possible. Otherwise, the load capacitance combined with the volume control output resistance makes a low pass filter that cuts away treble in the audible frequency range. At <http://www.DACT.com>, DACT offers a free tool for download. It is called the Attenuation Curve Calculator (ACC). With a few inputs, the ACC gives curves showing the volume control output frequency response.

The general recommendations when using a passive volume control are:

- * Use as short interconnect cables as possible from the source to the volume control and especially from the volume control to the power amplifier. The passive volume control should be placed near the power amplifier or even better built into it.
- * Use cables with low capacitance per meter. Many manufacturers of interconnect cables specify the capacitance.
- * Use low attenuator resistance values. Unless there are special concerns, we recommend using a DACT 10 kOhm attenuator for passive volume control applications. However, always make sure that the source (for instance the CD player) is able to "drive" the load. In the case of a passive volume control, the worst case loading of the source is with the volume control turned fully up. The load will then be the attenuator resistance in parallel with the input impedance of the following stage (often the power amplifier).

Using DACT stepped attenuators as passive volume controls is straightforward. Please also see Fig. 1.

If you use a 2-deck DACT attenuator as volume control you will have a volume control that regulates the sound level in both channels at the same time. Due to the accuracy of DACT attenuators (tracking between the two channels is within $\pm 0.05\text{dB}$), there will be no need for a balance control to compensate for potentiometer inaccuracies. However, to compensate for channel balance errors in the other equipment or in the recording, a balance control may be needed. A good choice is DACT's CT4 stepped balance control.

If you prefer to have independent volume control for the two stereo channels, you may use one 1-deck DACT attenuator as passive volume control for each channel.

If your other equipment is balanced (XLR sockets) you may build a balanced passive volume control by using either a 4-deck attenuator or two 2-deck attenuators.

Finally, a passive 6-channel volume control may be built from a 6-channel DACT CT2 attenuator.

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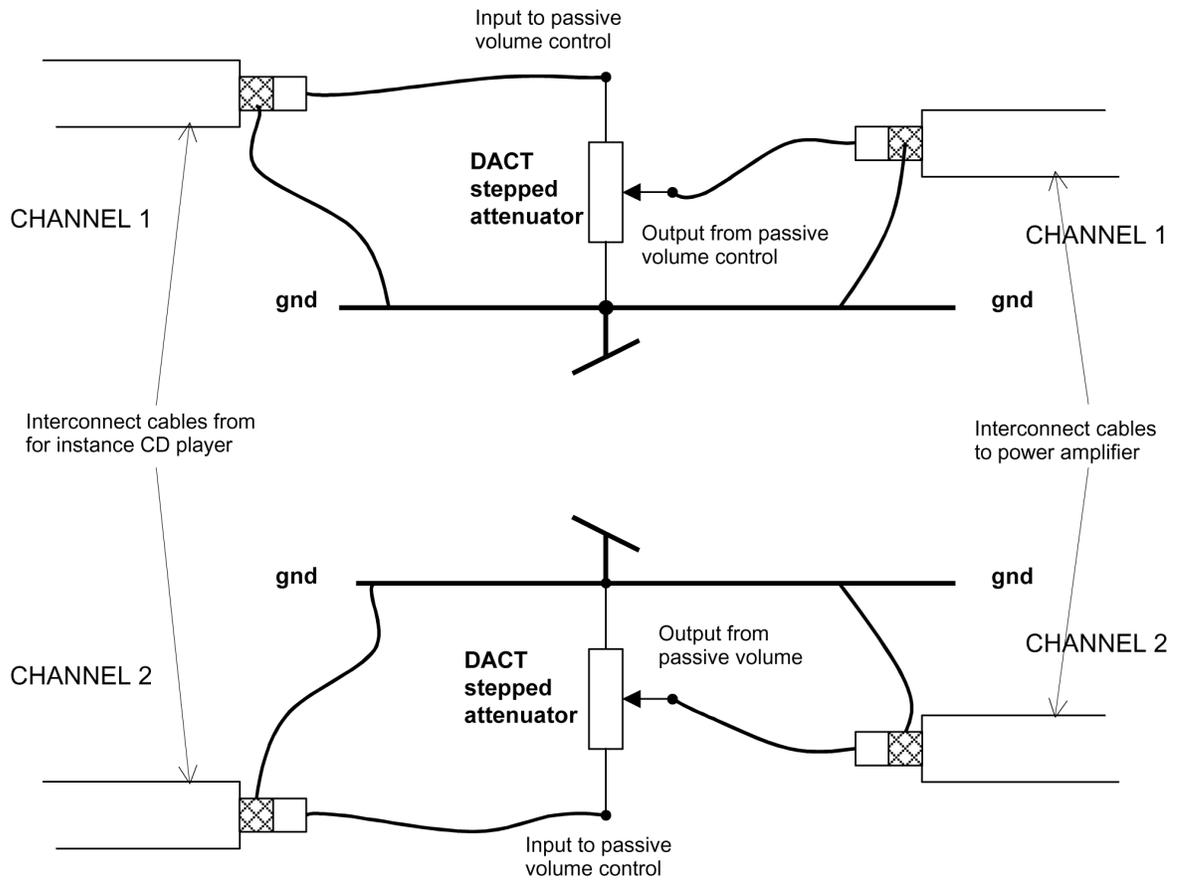


Fig. 1. Wiring a 2-channel passive volume control