

## HEADPHONE CONNECTIONS

Most headphones used today in high fidelity systems are of the low impedance type (4 to 20 ohms) and are designed to be connected to the output of a power amplifier through a suitable sensitivity-reducing network. Check with your dealer or the headphone manufacturer as to the availability of ready-made adapters for this purpose or specific recommendations for connection of your particular phones. Some manufacturers supply their phones with built-in networks on request.

Reducing networks are required for two purposes. First is to reduce the sensitivity of the headphones to the same level as loudspeakers to avoid overload of the headphones by the driving amplifier. Second, since headphones are considerably higher in efficiency than even the highest efficiency speakers, they will reproduce the inherent noise in any amplifier and preamplifier to a much greater extent than speakers unless their sensitivity is reduced. This noise is not normally heard over loudspeakers, so it is only necessary to reduce sensitivity to that of the loudspeakers used. This can be easily accomplished by connecting a 250 or 300 ohm, two watt potentiometer in series with the "hot" lead from each stereo half of the low impedance headphones. Once the headphones are connected through the potentiometers, they may be connected to any normal output impedance of the amplifier, regardless of the rated impedance of the phones. It is suggested that they be connected to the same output connection as the loudspeakers. The potentiometers should then be adjusted so that the overall efficiency of the headphones is the same as the speakers. After fine adjustment is made for channel balance, it should not be necessary to use the potentiometers again. If desired, one fixed one watt series resistor between 100 and 300 ohms in each channel can be used for a simpler hook-up.

In most installations it is desirable to have a switch for selecting just the headphones, or both headphones and speakers. The diagram overleaf shows schematically how to connect the most common 3-wire headphone jack (Switchcraft type 12B or equivalent), the potentiometers and a double-pole double-throw (DPDT) switch to the output of the amplifier. Note that the tip of the plug is the left channel "hot" connection. Since there is little problem of hum pickup, a small chassis box or panel for these parts may be used and mounted where convenient, as shielding is not critical.

It is important that the DPDT switch be turned to activate the speakers if the headphones are disconnected, to avoid operating the amplifier without a load. With transistor amplifiers, all switching should be done while they are off, or at very low volume levels. To protect the headphones, they should be disconnected when the speakers are to be played at very high volume levels.

Headphones of medium impedance (200 to 2000 ohms) may be used at the output of the power amplifier in like manner, with a 5000 to 10,000 ohm one-half watt potentiometer, or fixed resistor between 1500 and 3000 ohms.

Headphones of 400 ohms or higher impedance can be connected directly to the output of the Dynaco PAT-4 transistorized preamplifier as well.

It is not generally possible to connect low impedance headphones to the output of any tube-type preamplifiers or tuners without an amplifier because of the loading effect of the headphones which will greatly reduce the volume, increase the distortion and decrease the bass response.

