Subject: Feedback
Posted by Wayne Parham on Wed, 02 Jun 2004 18:35:44 GMT
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I see feedback brought up fairly frequently in tube amp discussions, but not as often in regards to solid state amps. Usually, when I see feedback discussed for a solid state amp, it appears to be used to sort of capture the attention of tube enthusiasts. But in either case, feedback is usually mentioned on a subjective level and rarely in the context of circuit design and the "whys and what fors." So I'd like to see a good technical discussion about feedback here.Very simple circuits with minimal components sometimes have no feedback. The simplest circuits are limited to an active component and practically nothing else. Usually they include biasing and coupling components, but not always. Such simple circuits have fixed gain of hfe or mu and input and output impedance equals the impedance of the active device inputs and outputs.Some biasing components will introduce negative feedback when signal current flows through them causing a voltage drop that biases the active device in a negative direction. This is actually very common. A bypass component has to be added to the circuit to reduce negative feedback. When components are placed around the active device, it chances the circuit's gain, frequency response and input and output impedance. These are usually required and their effects are usually desirable.Negative feedback can be employed on a single stage, as is the case when an emitter or cathode resistor is used without a bypass capacitor. It can also be employed globally, by running an output signal back to the input in reduced amplitude and opposite phase. This is generally done on more complex amplifiers.Negative feedback reduces distortion, but it does so at the expense of reduced gain. That increases the number of gain stages required. Positive feedback increases gain, but it does so at the expense of increased noise, distortion and reduced circuit stability. Excessive positive feedback will cause an amplifier to oscillate. But it was a common technique used in early radios to get enough gain; Global positive feedback was used in old radio circuits called "regenerative" receivers. Hetrodyne and Superhetrodyne circuits made them obsolete.There are pros and cons of each kind of amplifier circuit configuration. I'd like to hear from some of the tube gurus on this one, because I think the topic of feedback is one that's not well understood.