Regular stereo amplifier can be variable ac source

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Here's how to turn an ordinary hi-fi stereo amplifier into the power supply for a variable-frequency power source. The setup produces a regulated ac output voltage that typically contains less than 0.2% distortion and that is adjustable from 0 to 130 volts root-mean-square at any frequency between 50 and 400 hertz.

The two channels of the stereo amplifier are driven 180° out of phase with each other so that the load can be connected differentially across the amplifier's "hot" output terminals. This technique avoids the inherent danger of paralleling the outputs of a transistorized power amplifier.

The output power available depends primarily on the particular power amplifier used. (About 220 watts can be obtained from an amplifier like the Sony TA-3200F.) Naturally, the amplifier's power bandwidth characteristics must satisfy the application. Usually, any oscillator that has an rms output of 5 V with less than 0.05% distortion will be adequate. If the precise operating frequency matters, then the oscillator's frequency accuracy and stability also are important. In some applications, a frequency counter might be a useful addition.

Variable-frequency power sources are available commercially as single-package systems costing from $700 to $1,100 for a 250-W unit. But all the equipment required for the setup shown in the diagram can be purchased new for less than $600. And even greater saving can normally be realized, since a suitable oscillator is generally available in most laboratories. If a suitable hi-fi amplifier can also be "found," the cost of the complete setup can be pared to a mere $35.

Transformer T_1 provides two equal-amplitude but opposite-phase drive signals for the power amplifier. Since most hi-fi power amplifiers have an input impedance of around 50 kilohms, impedance matching need not be considered. Transformer T_1 must have a good low-frequency response and a turns ratio that provides the proper drive level for the power amplifier. Generally, a turns ratio (from primary to each half of the secondary) of 1:1 or 2:1 is suitable for most oscillator/amplifier combinations.

A good frequency response from 50 to 400 Hz is also essential for transformer T_2. The turns ratio required for T_2 depends on the power-output rating and load characteristics of the power amplifier. To determine T_2's turns ratio, it's necessary to compute the amplifier output voltage (per channel) appearing across the specified load impedance (which is usually 8 ohms) at the maximum rated power output:

$$E = \sqrt{P_{out} R_{load}}$$

Since transformer T_2 is operated "backwards," select a 120-V power transformer with a secondary voltage rating that is twice this calculated amplifier voltage. □

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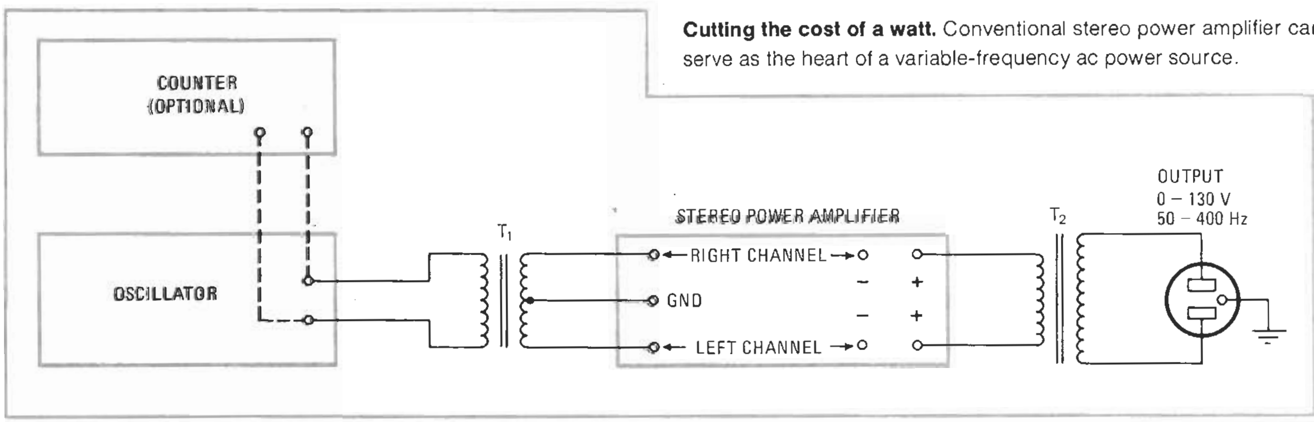

Cutting the cost of a watt. Conventional stereo power amplifier can serve as the heart of a variable-frequency ac power source.