Stereophonic Power Line Audio Transmission

Block Diagram
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Project Description
A modulated audio signal will be transmitted and received over the power lines inside a building. Both the left and right channels of a line out signal from an audio device will be placed onto these power lines by means of a transmitter, and received at a remote location inside the building. The receiver will convert the signals into a stereo line out signal, which will be sent to a dual speaker-amplifier combination. This received signal will comply with hi-fi stereo quality standards. In addition to the transmitter and receiver, a blocking filter will be constructed to prevent contamination to and from the community power lines exterior to the building.

Block Diagram of Overall System

NOTE: Currently, the stereo and the amplifier/speaker combination are external to the system and will not be described here.
Subsystem Diagrams and Descriptions

Transmitter
The transmitter will receive a line out signal from an audio device. The transmitter will then modulate the signal and send it to the power lines. The exact method of modulation to be used is yet to be determined. Each channel of audio (left and right) will be assigned a separate carrier frequency and then shifted to a higher frequency location to avoid the 60Hz AC signal that is on the power lines.

- Input – line out from audio device (both left and right channels); power
- Output – modulated audio signal to power line (outlet)

![Transmitter Subsystem Diagram]

Figure 2: Transmitter Subsystem

The DC power supply will convert the AC signal to a DC signal which will provide power to the active circuitry. The two modulators will modulate the audio signals to two separate blocks of bandwidth. The summing amplifier will then combine the two signals to allow for transmission across the power line. The isolation transformer will protect the circuitry from the high voltages on the power line.
**Receiver**

Using filters to extract each signal from the power lines, the receiver will demodulate the signals. The demodulated signals will then be restored to line out specifications. These signals will then be sent to external amplifiers, or possibly to an onboard amplifier that can directly power speakers.

- Input – modulated audio signal from the power line (outlet)
- Output – line out signal

![Diagram of Receiver Subsystem](image)

**Figure 3: Receiver Subsystem**

Once again, the DC power supply will provide power to the active circuitry. The isolation transformer will separate the power line ground from the active circuitry ground. The high pass filter will remove the high voltage 60Hz signal and leave only the modulated audio signals. The demodulators will then return the modulated signals to audio signals exhibiting line out characteristics.
**Blocking Filter**

This component will confine the audio signal within a given house, preventing it from leaking onto the community power lines. The noise from the components will be attenuated to available standards, which have not yet been found. Low impedance will be maintained to prevent loss of power or generation of excess heat.

- Input – Power line with modulated audio signal
- Output – Pure 60Hz, 120V power signal

Figure 4: Blocking Filter Subsystem