

An Introduction to Power Conditioning for HiFi Applications

Why do I need power conditioning for my HiFi system?

A high performance sports car will not perform to its maximum unless it is run on the very best available fuel. It can have gold plated fuel lines, platinum spark plugs and a state of the art fuel pumping system, but if the fuel tank is full of vegetable oil the performance potential will never be realised.

Similarly, your HiFi system is unable to function to its maximum potential because the fuel supplied to it from the mains is contaminated. Imagine you could see the sound produced by your HiFi system. Electrical pollution or 'noise' on the mains supply would cause that sound to dim, brighten and flicker, as your HiFi components tried to process the contaminated signal.

HiFi source components are very sensitive to electrical pollution because the audio signal they produce is at a very low voltage, and this signal must be amplified in order to drive the speakers. Amplification is achieved by using the incoming mains supply to electronically boost the signal, and a polluted mains supply will prevent the electronics within your HiFi equipment from operating as intended. This causes a cascade effect within the electronic circuitry, resulting in a polluted amplified signal.

What's wrong with the mains supply?

If viewed on an oscilloscope, the ideal (UK) electrical supply would be a perfect sinewave with a frequency of 50 cycles per second (50Hz), an amplitude of 230Vac (RMS), and absolutely no other signal would be apparent. In reality however, this is unlikely to be the case, as there are many factors that will have a detrimental effect on the electrical waveform.

The many miles of electrical cable between the power station and your home acts as a huge aerial, picking up unwanted radio signals (RFI), and superimposing them onto the electrical supply as high frequency noise (see fig 1). Unshielded cables running alongside one another will interact; as the electromagnetic field (EMI) generated by one live cable will interfere with the cables beside it (see fig 2).

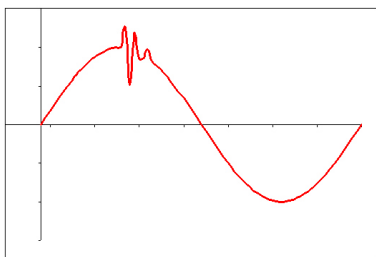


Fig 1. Radio Frequency Interference

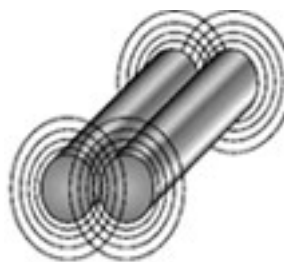


Fig 2. Electromagnetic interference

Also, local power use can raise or lower the voltage level; as factory equipment is started, the huge demand for power can lower the supply voltage from the substation (which also supplies domestic properties), similarly when the factory equipment is switched off, the voltage level can rise significantly.

Other forms of electrical pollution include power surges or transient voltages (see fig 3), which can be generated by local lightning strikes (impulse), or certain types of equipment such as laser printers or fluorescent lighting (oscillating). Transient voltages typically last for a few microseconds but often have huge currents running into many thousands of amps (kA).

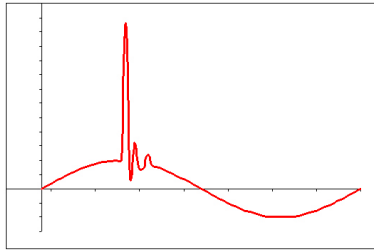


Fig 3. Transient voltage

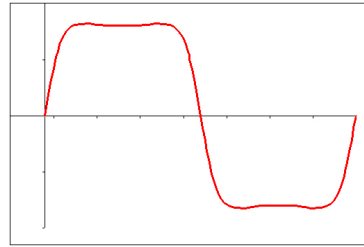


Fig 4. Harmonic distortion

Another problematic electrical pollutant is harmonic distortion of the waveform. This is caused by equipment that takes electrical energy in such a way that it distorts the sinewave (see fig 4). In a domestic environment harmonic distortion is usually attributed to equipment that has a 'switched mode power supply', such as a computer.

If the mains supply is so bad how come everything in my house works?

Most domestic electrical equipment such as fridges, freezers, lighting etc is able to continue operating with low levels of pollution, (although you may see the lights dim or flicker), but they will certainly suffer a reduced lifespan. Unexplained or premature failure of domestic electrical equipment is most often caused by mains supply problems.

Imagine a very poorly constructed road, although you could still drive along it, the journey would be uncomfortable and the suspension on your car would suffer.

So what can I do to improve the mains supply to my HiFi?

There are many steps that can be taken to improve the mains supply to your HiFi system. The simplest of these is to provide a dedicated supply to your system (see fig 5), as this will help prevent contamination from other equipment operating on the same electrical circuit.

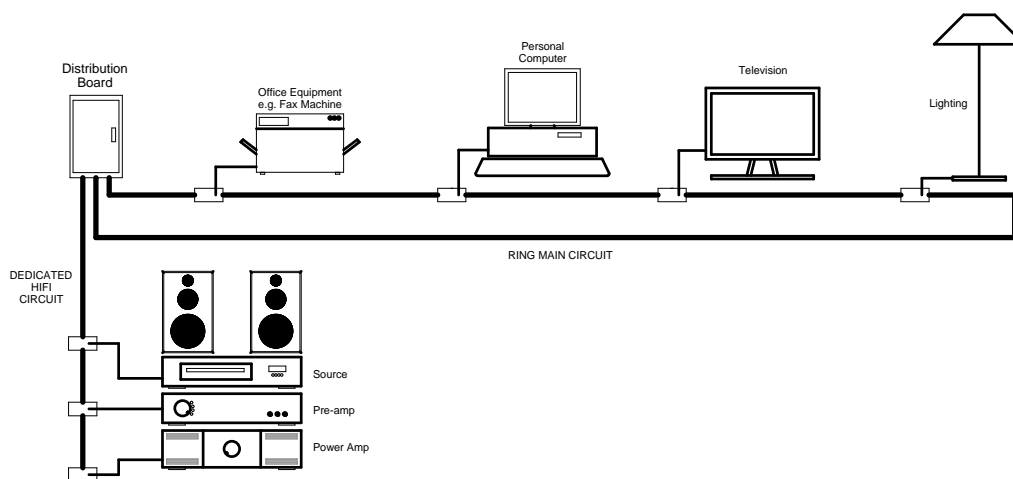


Fig 5. HiFi system on a dedicated supply spur

A second step would be to provide a dedicated clean earth to your system, this is important because some equipment (such as computers) will have noise filters on the input, which will redirect some of the incoming pollution from the mains onto the earth line. This can have a detrimental effect on any other equipment using the same earth line.

Ideally, all components in your system should be electrically isolated from one another to prevent any cross contamination. However, in reality this is not strictly necessary as some components (such as the power amp) are more likely to induce pollution onto the mains, and other components (such as a turntable or pre-amp) are more susceptible to electrical supply problems. Therefore it is more important to electrically isolate the front-end components from the power amp (see fig 6).

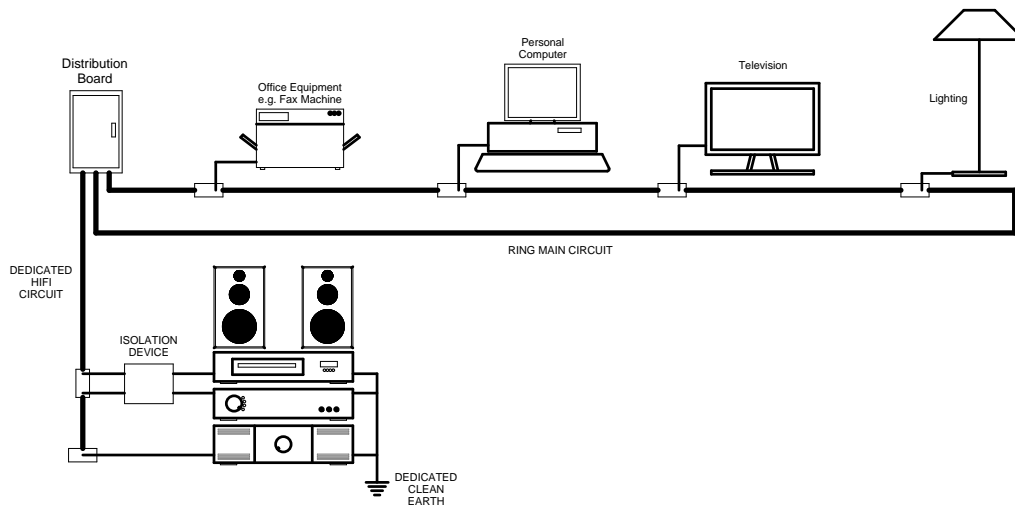


Fig 6. HiFi system on a dedicated supply circuit with front-end isolation and a dedicated clean earth

To get the absolute best from your system, you must provide your source and front-end components with a conditioned, isolated, pollution free, pure sinewave electrical supply. This can be achieved with an ASR sinewave regenerator from Advance Electronics Ltd.

There are many HiFi power conditioners available from Isotek or PS audio, why do I need an ASR unit?

The ASR sinewave regenerator is the only product on the market that incorporates a ferro-resonant constant voltage transformer. These are very specialised power conditioning transformers that are typically used for mission critical applications where a poor quality mains supply is simply not an option.

A constant voltage transformer contains no electronic components or moving parts, which leads to a reliable and robust unit with a proven product lifespan of over 25 years.

The ASR provides pure sinewave regeneration with total galvanic isolation, superior levels of electrical noise attenuation (up to 75dB), output voltage correction and transient surge suppression.

Connecting an ASR to the front-end of a HiFi system gives an improvement in audio quality that is (to quote our customers) truly astonishing.

OK so my HiFi needs an ASR, where can I get my hands on one?

The ASR sinewave regenerator is available direct from Advance Electronics Ltd.

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