HIGH SPEED RECTIFIER APPLICATIONS IN HIGH END AUDIO

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High end audio is one of the few subjective areas of electronic design. In almost all fields of hardware development a system either works or it does not. In high end audio component design it is entirely possible to have a piece of equipment that works (meets all paper specifications) and sounds horrible.

Component selection in areas that would appear to be insignificant to the success of a design, can effect the ultimate sound quality of a component in a negative way. One of the areas that is overlooked is the input rectifier that lives off the secondary of the power transformer Fig. 1. Traditionally these rectifier sockets have been filled with standard recovery diodes. On the surface this would appear to be a good selection, since the fundamental frequency of the line current is 60 Hz
(50 Hz in Europe).

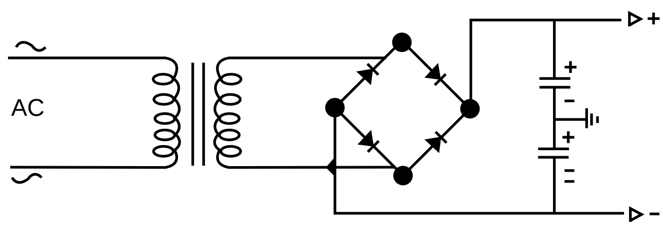

Fig. 1

Critical listening tests have demonstrated that the recovery time (Fig. 2) and type (soft or snappy) has an effect on the “subjective quietness” of a high end audio product. This is not “quietness” from the standpoint of signal to noise ratio traditionally measured in decibels. This is a subjective sense of silence between notes in a musical passage. To investigate further, this phenomenon can be measured with a spectrum analyzer. This was demonstrated in an article by Rick Miller with pictures and data in the “Audio Amateur” of Jan ‘94. The higher order harmonics generated by the recovery time of the standard speed rectifier can be clearly viewed on the spectrum analyzer. These upper harmonics are absent (or at least below the noise floor of the instrumentation). Audiophiles spend lots of money on AC line conditioners to eliminate line noise from the power supply inputs to their equipment, which is certainly counter productive to generating this noise internally. This component substitution is easy to accomplish.

With regards to Schottky rectifiers concerning low voltage applications, many solid state designs can utilized schottky rectifiers. Schottky rectifiers have switching speeds in the single nanosecond times and below. They are available to 60 Volt $B_{(VR)}$ maximum. These are ideal for almost all solid state preamplifiers, CD players, digital processors, tuners, high end surround sound, low voltage class “A” power amps and tube filament supplies.

Tubes (also known as valves) are still widely used in high end

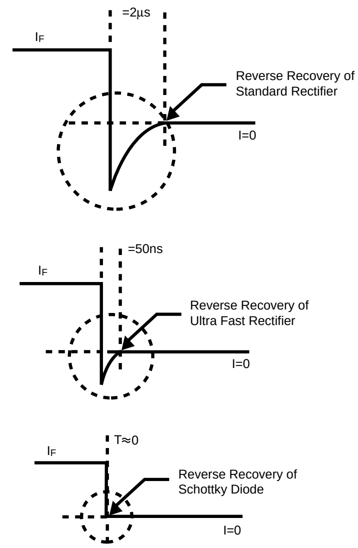

Fig. 2

audio circuitry. These components require much higher operating voltages than solid state designs. The SUF15 and SUF30 diodes are ideal 1.5 and 3.0 ampere diodes with a B_{VR} of 600 Volts (J class). The SUF15J is ideal for tube preamplifiers for new designs or as a retrofit. The SUF30J is a 3.0 Ampere 600 Volt rectifier ideal for valve power amplifiers.

Power amplifiers typically use a bridge rectifier after the power transformer. Unfortunately, G.I. does not make high power fast recovery bridges. It is necessary to build the bridge assembly out of components utilizing the TO-220, TO-3P or paralleling discrete 4.0 ampere diodes. Based on the facts that the UG series is very fast, exhibits a “soft” recovery waveform, and is available in up to 200 volts B_{VR} makes it ideal for this application. These are very effective in the standard modern solid state power amplifier ie; B&K, Adcom, Hafler, Bryston and all their spinoffs.

Attention to the front end of the power supply in high grade audio gear is essential, if a design is going to deliver the best possible sound quality. In addition, it is possible to design “AC line conditioning” into the AC front end of the power supply, minimizing the need for external power conditioning equipment. If all this is done, the DC rails of properly designed equipment should be unbelievably quiet.

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