1. Studies On Residential Power Line Noise - Part 1

Introduction

By necessity, I am a meter pontiff in my professional life. In my audio life, I prefer to use my ears as the primary measurement tool for the evaluation of good sound. Many of the desirable attributes of good sound can not be measured by currently available testing methodology and equipment. Quantities such as power, impedance, harmonic distortion, etc. can easily be measured. Other quantities, such as those responsible for imaging properties, can not be easily measured. Indeed, to my knowledge, those quantities have not yet been identified!

We do know that, generally, assuming good design and construction techniques have been followed, the more noise we remove from the signal path, the better the resulting sound staging, imaging and musical detail.

Although noise removal from the signal path must be given rigorous attention in order to achieve good sound, noise in the power delivery path must be given the same rigorous attention. Why? Because the power delivery path provides the electrical energy, the "raw material", that an audio component uses to recreate a musical event.

I wanted to obtain some data on the quality of power delivered to my two channel audio system. Over a one week period (Friday to Friday) at various times of each day, I measured the wall voltage at the dedicated audio outlets in my living room. I also measured the wall voltage at various other outlets throughout my home. During nights and early mornings (12am - 6am), the new dedicated outlets measured about 1 volt higher than the old dedicated audio and other household outlets. During the day and early evening, the dedicated audio and other household outlets measured very close to one another, with a typical difference of +/- 0.3 volts between them. A Radio Shack digital multimeter was used to measure wall voltage. During the measurement week, voltage levels ranged from a low of 118 volts (two afternoons at 5pm) to a high of 122.7 volts (two mornings at 4am). There were only two days where a voltage less than 120 volts was seen.

On the last day of the measurement week, between 4:30pm and 5:30pm, a Tektronix model TDS 2012 oscilloscope was used to generate sine wave plots and spectral plots of the line noise on the dedicated audio outlets.

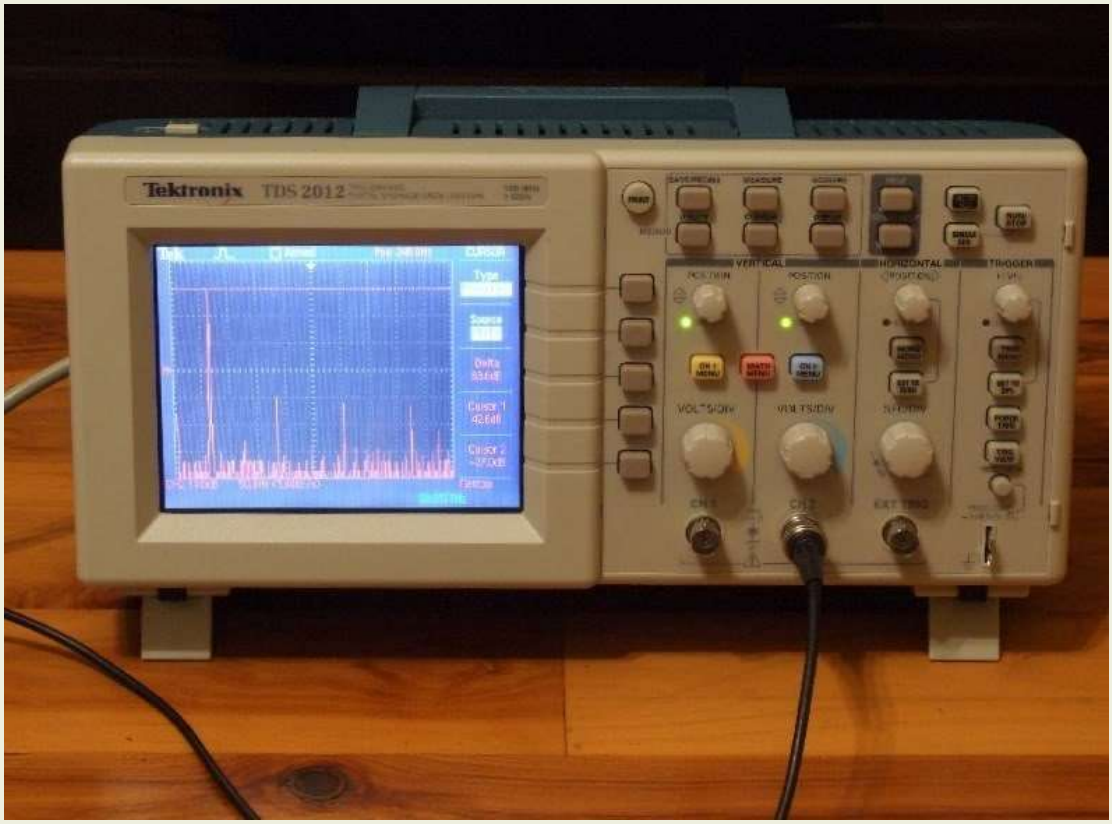

Figure 1. An oscilloscope is a handy thing to have around the house...if you want to see the noise gremlins hiding in your wall.

Sine Wave Plot

Sine wave plots are good for letting you see how distorted (or not) the power is coming out of your wall. Spectral plots (Fast Fourier Transform plots) are good for letting you see what is causing the distortions.

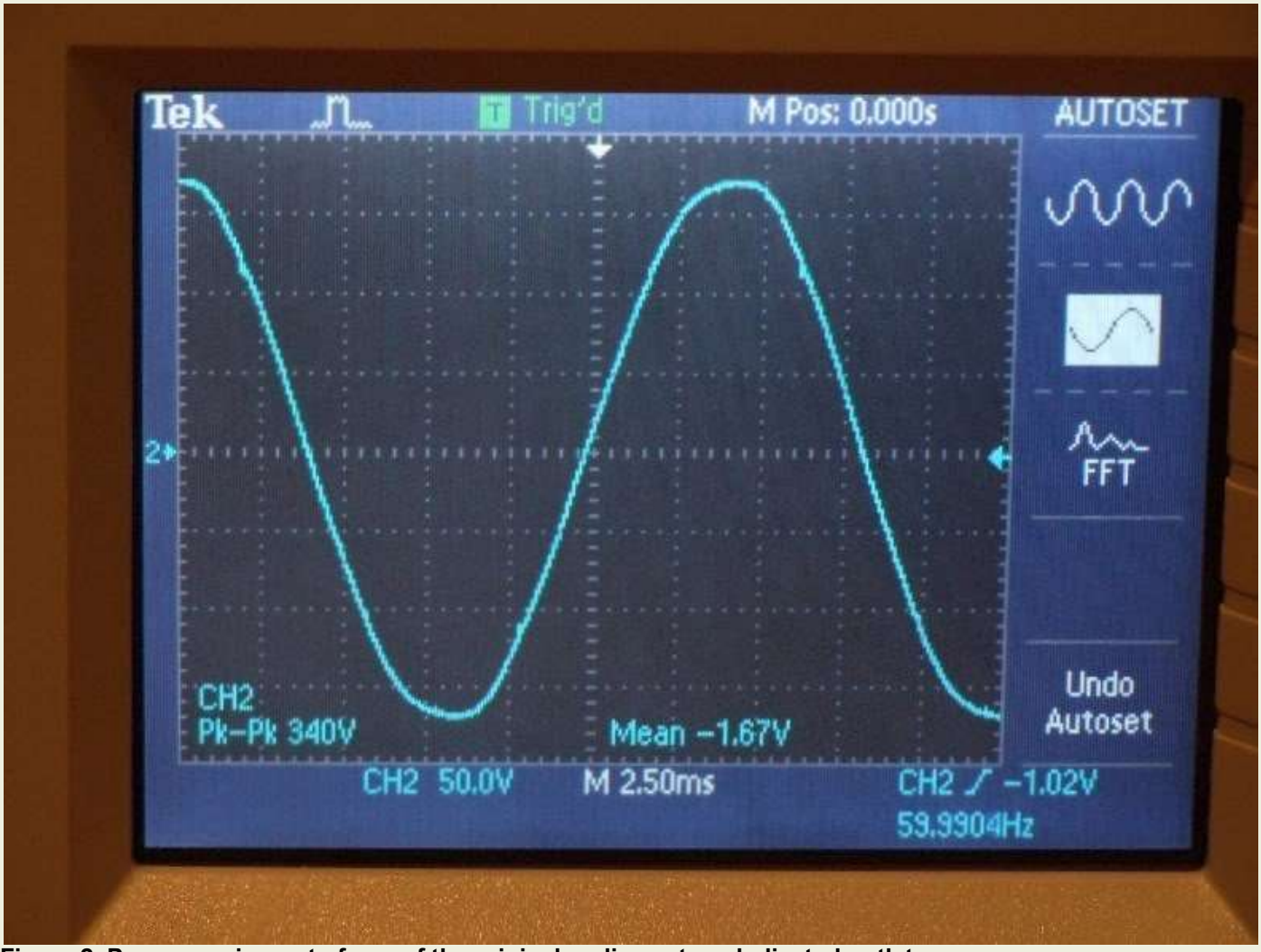

Figure 2. Power coming out of one of the original audio system dedicated outlets.

Each vertical division of the oscilloscope screen represents 50 volts. Each horizontal division represents 2.5 milliseconds. The sine wave coming out of one of the original dedicated outlets for the two channel system does not look too bad. Evidence of mild waveform distortion is seen in the "bumps" along the waveform and in the flattening near the upper and lower peaks. The oscilloscope measured a peak to peak (from the lowest point to the highest point of one sine wave) voltage of 340 volts. This corresponds to a "wall" voltage of 120.2 volts (340 volts divided by 2, then divided by the square root of 2 equals 120.2 volts). As we will see later, gremlins are quite adept at hiding behind walls and rather benign looking sine waves.

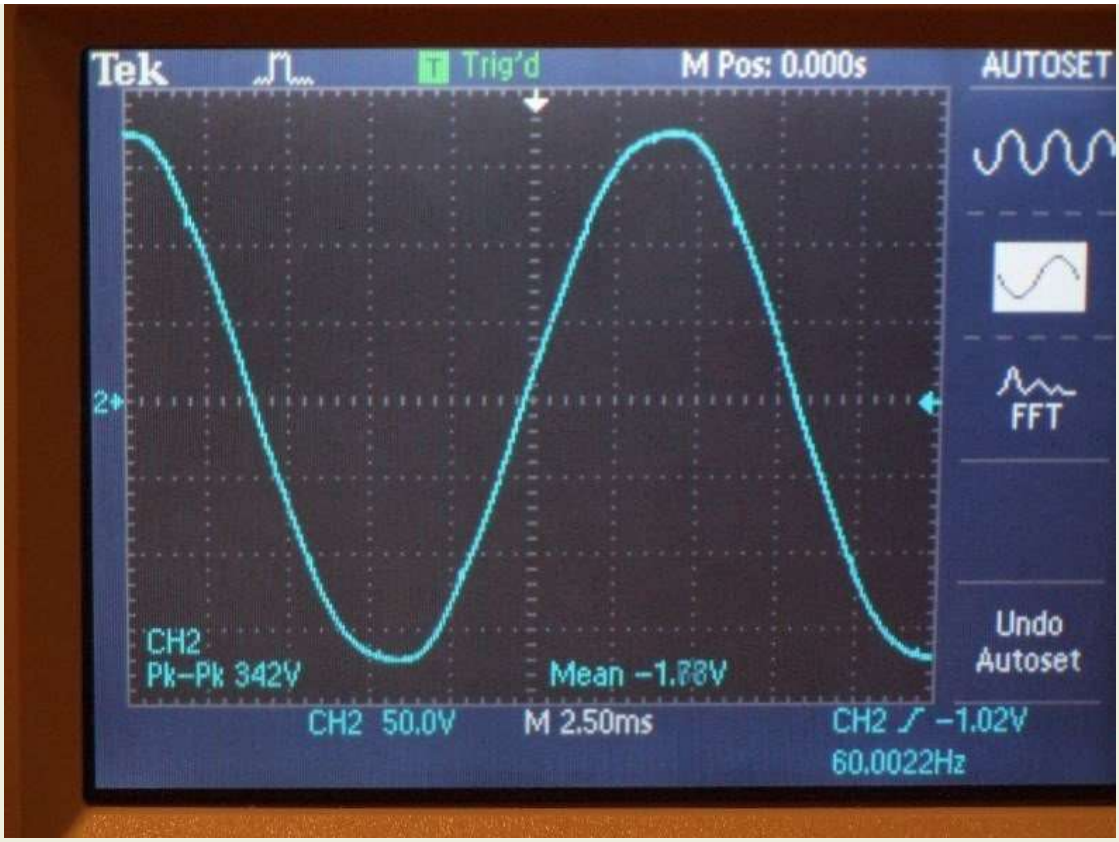

Figure 3. Sine wave plot of the power from one of the original dedicated outlets (20A circuit) with wireless networking equipment plugged in.

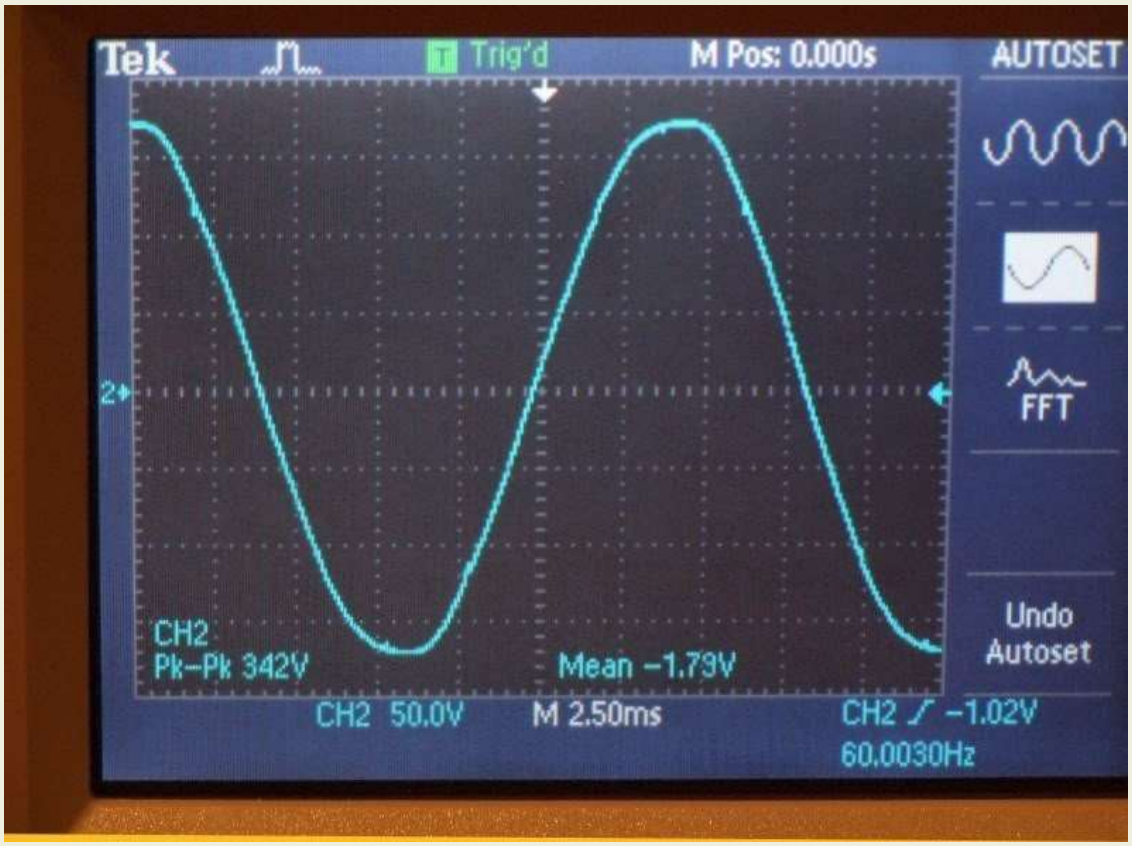

Figure 4. Sine wave plot of the power from one of the original dedicated outlets with wireless networking equipment unplugged. Measurement was taken from a Signal Cable MagicStrip (10 AWG).

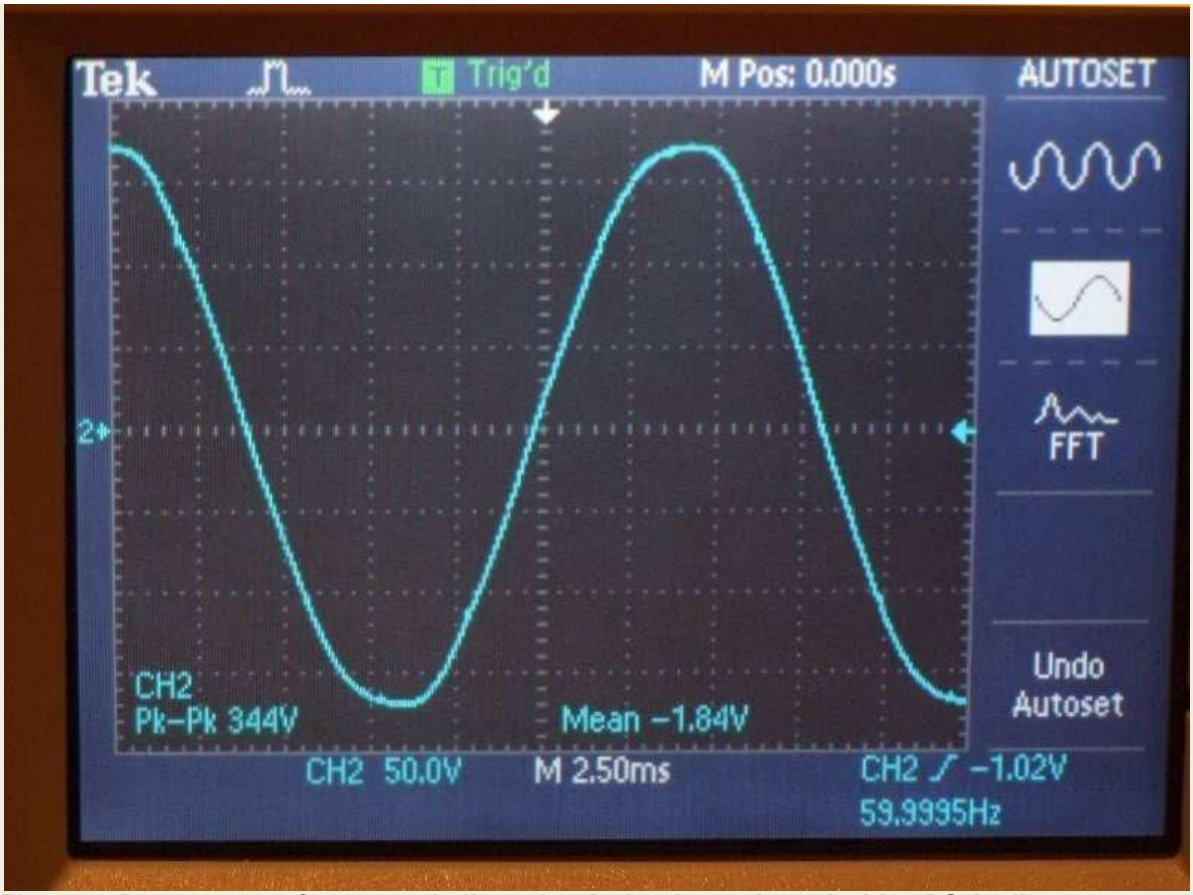

Figure 5. Power output from new dedicated 20A circuit terminated with a PS Audio Power Port receptacle.

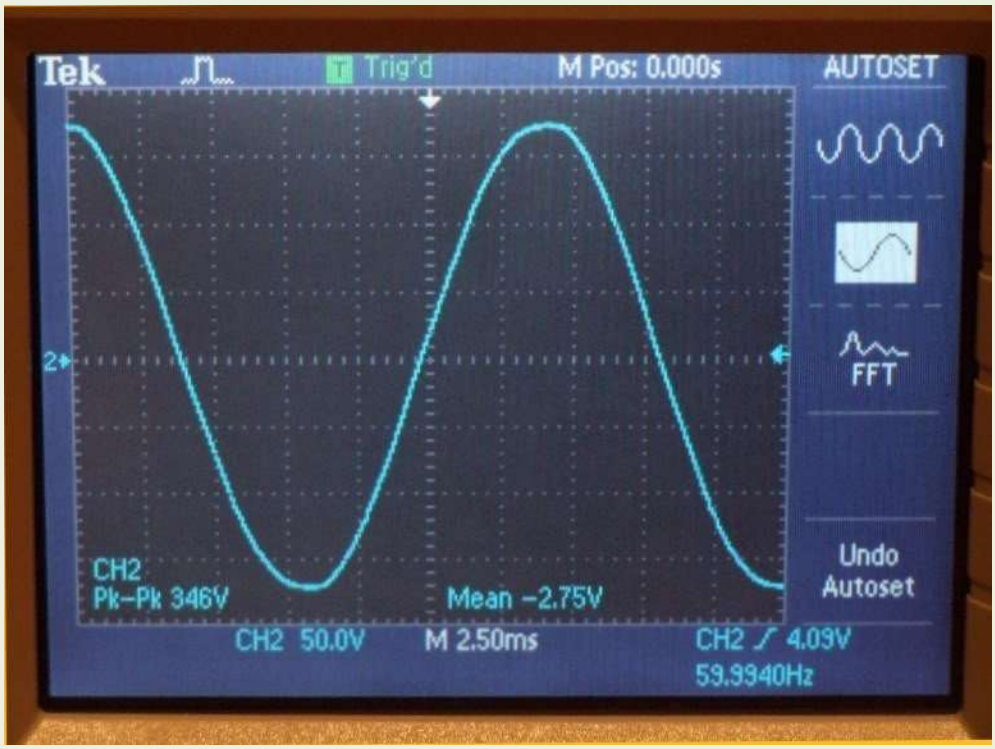

Figure 6. Power output from PS Audio Statement SC power cable connected to new dedicated 20A circuit terminated with a PS Audio Power Port receptacle.

The sine waves for (1) one of the the original dedicated outlets (figure 2), (2) the Signal Cable MagicStrip (10 AWG) with wireless networking equipment plugged in (figure 3), (3) the Signal Cable MagicStrip with wireless networking equipment unplugged (figure 4), and (4) one of the new dedicated outlets terminated with a PS Audio Power Port receptacle (figure 5) are very similar, showing a fairly smooth sine waveform with a few distortion "bumps" along the waveform and some flattening near the upper and lower peaks. The primary differences were a slight variations in

output voltage: 120.2 volts (340 volts peak to peak) from one of the original dedicated outlets, 120.9 volts (342 volts peak to peak) from the output of the Signal Cable MagicStrip connected to one of the original dedicated outlets, and 121.6 volts (344 volts peak to peak) from a Power Port outlet on one of the new dedicated circuits.

The plot in figure 6 was taken from the output of a PS Audio xStream Statement SC power cord (8 AWG). The distortion bumps are gone and the flattening near the peaks has diminished. The peaks show a more symmetrical shape on either side of the peak midpoints. This verifies PS Audio's claim that the Statement SC has a "cleaning" effect on the power signal. The voltage was raised a bit to 122.3 volts (346 volts peak to peak) due to the much lower resistance of the larger gauge cable.

Spectral Plots

Time domain plots (signal amplitude vs. time) are good for showing the net effect of noise components (those gremlins). However, residential noise gremlins are usually are not of sufficient size to cause gross distortions in the power signal coming from the wall. They usually are small in size and prefer to attack in large numbers over a large area. This makes it harder to pinpoint and eradicate them...or so they think. If we wish to find out exactly where and how big the gremlins are, we need to look at a frequency domain plot (signal power vs. frequency). Frequency domain (spectral) plots show the power contained in each frequency component of a signal.

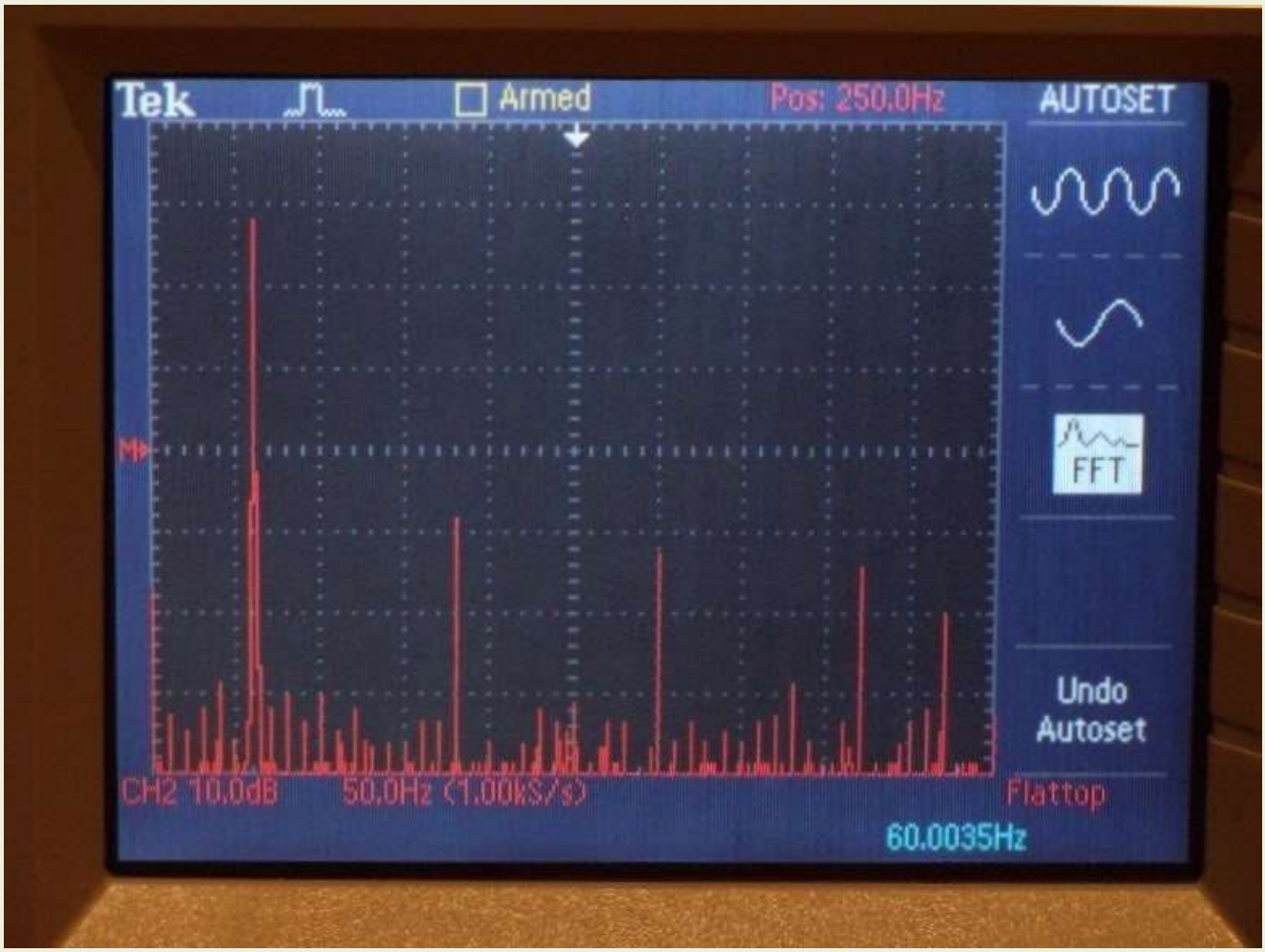

Figure 7. Spectral plot of power coming from one of the original dedicated audio outlets.

Figure 7 shows the spectral plot for the power coming from one of the original dedicated audio outlets. Each vertical division of the spectral plot represents 10 dB. Each horizontal division represents 50 Hertz. The sampling frequency used for computing the Fast Fourier Transform was 1000 samples per second. The first spike on the left edge is the DC content in the power line. The next, and largest, spike, is the 60 Hertz, 120.2 volt AC power signal. The next three large spikes are the significant odd order harmonics at 180, 300, and 420 Hertz. Note all the trash (noise frequencies...gremlins ;)) grouped around the 60 Hertz spike. The spike at 60 Hertz is the only part of the signal useful in audio and video reproduction. All the other spikes, large and small, are **NOISE** and constitute the "**noise floor**". When noise is removed or attenuated, the height of the noise floor is reduced and more of the signal becomes apparent. Than is why lowering noise results in an apparently louder speaker volume, although the actual sound level remains the same.

When I initially noticed the last large spike at the right, I thought it was the 8th harmonic. But then, I thought that the 8th harmonic should have been obscured in the thick layer of low magnitude line noise at the bottom of the plot. Putting the oscilloscope cursor on that spike showed it to be at 470 Hz rather than the expected 8th harmonic frequency of 480 Hz. I knew that the significant 3rd, 5th, and 7th harmonics result due to the way power is generated by the utility company. I did not know where this 470 Hz noise was coming from. After some effort, I found out that the 470 Hz frequency is one of the control tones generated by the power company in order to communicate with residential power meters. Other tones are used to control or communicate with other devices on the power grid (street lights, etc.). **Surprise....some noise gremlins actually work for the power company and have a useful purpose in life**.

The voltage level of each of the fundamental and harmonics is calculated this way: The vertical axis does not start at 0 dB. It starts at a reference magnitude of -27 db (0.044 volts) The fundamental 60 Hz spike has a magnitude of 68.6 dB, therefore -27 dB + 68.6 dB = 41.6 dB, which is the absolute (real) magnitude of the fundamental 60 Hz frequency. A reference voltage of 1 volt rms (Vo) is assumed. The rms voltage (voltage coming out of the wall) is calculated by Vrms=Vo x 10^(dB/20) and for the 60 Hz frequency,

Vrms = 1 x 10^(41.6/20) = 120.2 volts.

The voltages of the DC component and the 3rd, 5th, and 7th harmonics were 0.65 volt, 2.14 volt, 0.98 volt, and 0.91 volts respectively. The 470 Hz control tone was at 0.45 volts. Although the typical voltages and energy levels of individual AC line noise components are very small compared to the main 60 Hz frequency, they collectively cause significant signal distortion which obscures detail in audio and video signals.

Part 2

1. Studies On Residential Power Line Noise - Part 2

Introduction

As part of my continuing efforts in subversive technical literature, I offer the second part of my "Studies On Residential Power Line Noise". Part 1 of this series is posted here.

An often recited mantra among power cable naysayers cult goes something like this:

"A power amplifier has all the required filtering it needs to remove power line noise. High priced, so-called "better" power cables are a scam." People who are hearing these so-called "improvements" are victims of placebo effect and are, in fact, having aural hallucinations."

There may be some amplifiers may not benefit from or even require a better quality power cord. Their power supplies may indeed filter out all the power line trash. I really don't know if such amplifiers exist. If they do, I imagine they would be quite expensive. All the amplifiers I currently own and have owned in the past have benefited sonically from better shielded, heavier gauge power cords with better connectors.

Some Quantitative Results

The 60 Hz track of the "Autosound 2000 Low Frequency Test CD" was used to feed a 60 Hz signal to my Parasound Halo JC 1 monoblock amplifiers. A Tektronix TDS 2012 oscilloscope was connected to the left amplifier outputs and sine wave and FFT (Fast Fourier Transform) plots were obtained. Each vertical dot on the FFT plots represents 2 dB of signal magnitude. Each horizontal dot represents 10 Hertz of frequency.

Oscilloscope readings were first taken at the left amplifier's output with the stock 14 gauge power cord attached. Next, oscilloscope readings were taken at the amplifier's output stock power cord replaced with a PS Audio xStream Statement SC power cord.

First, let us look at spectral plots of the power signals coming from the wall, the stock power cable, and the Statement SC power cable.

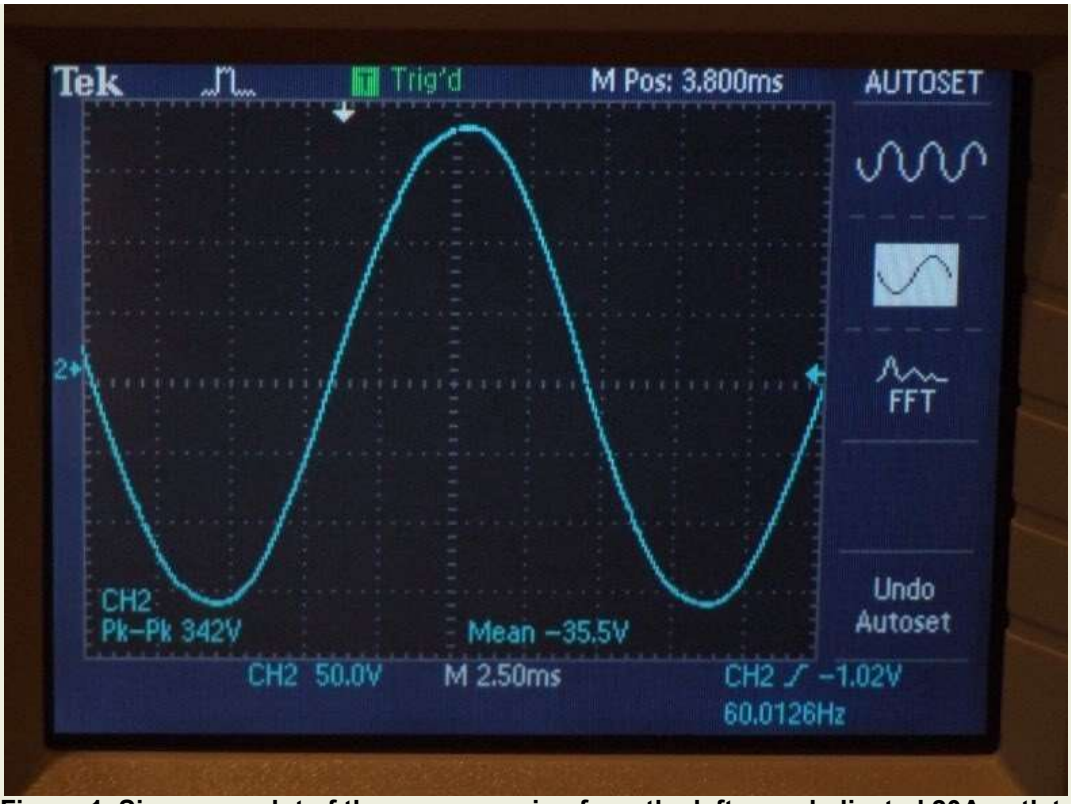

Figure 1. Sine wave plot of the power coming from the left new dedicated 20A outlet.

Figure 2. FFT plot of the power coming from the left new dedicated 20A outlet.

The dedicated power circuit is wired with Romex Simpull E18679 12 AWG wire. It is terminated with a PS Audio Power Port duplex receptacle.

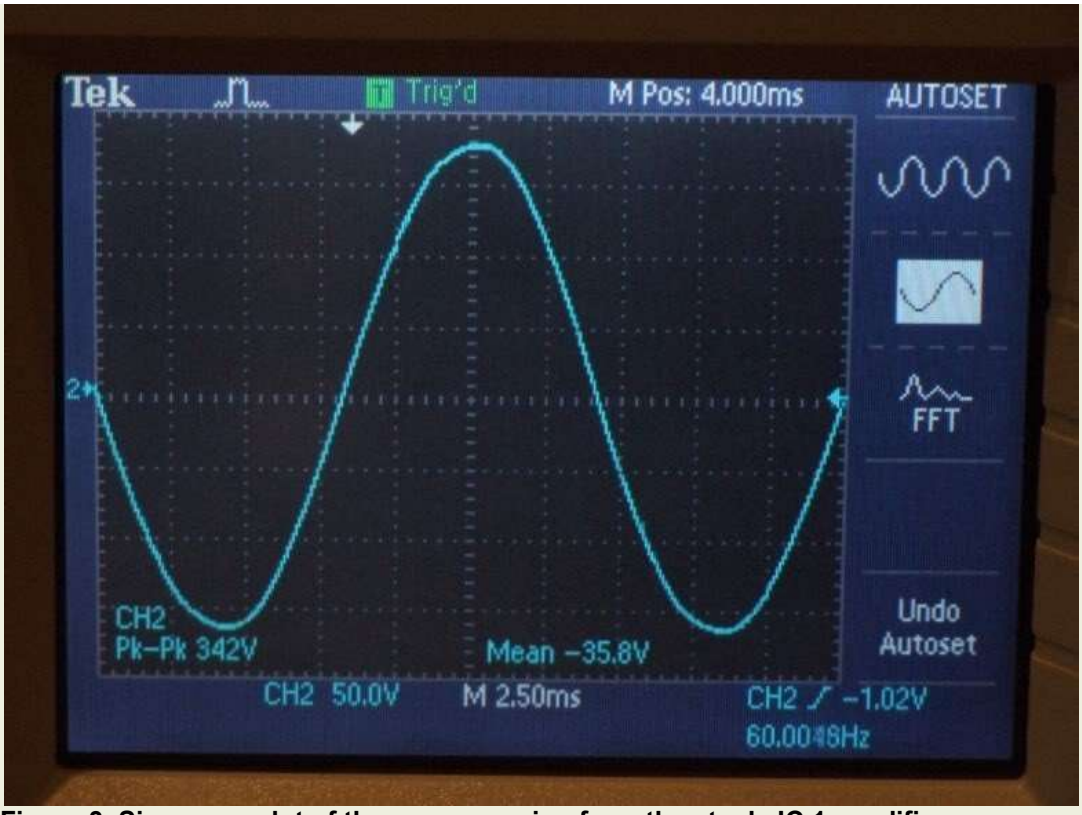

Figure 3. Sine wave plot of the power coming from the stock JC 1 amplifier power cord.

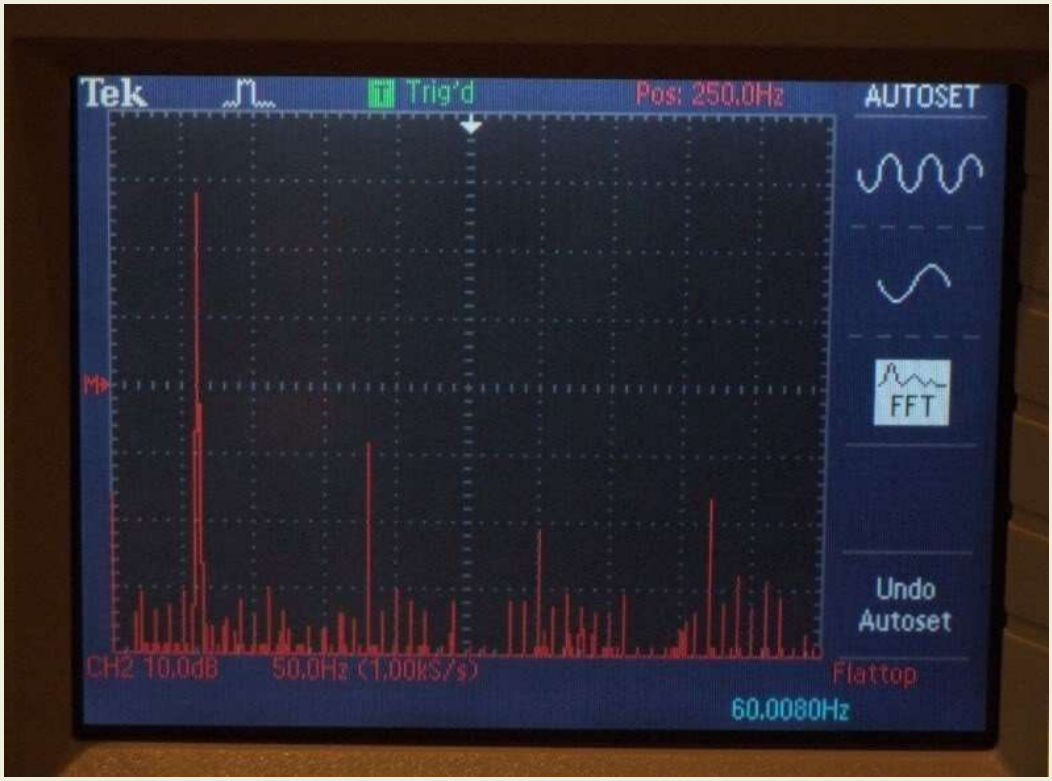

Figure 4. FFT plot of the power coming from the stock JC 1 amplifier power cord.

The sine wave plots of the power coming from the wall and from the stock power cord (figures 1 and 3) look nearly identical with identical voltage levels. However, when we look at the frequency domain (FFT) plots, the gremlins are revealed. Comparing figures 2 and 4, we see a substantial increase in noise around the fundamental 60 Hz frequency and the 3rd, 5th, and 7th harmonics.

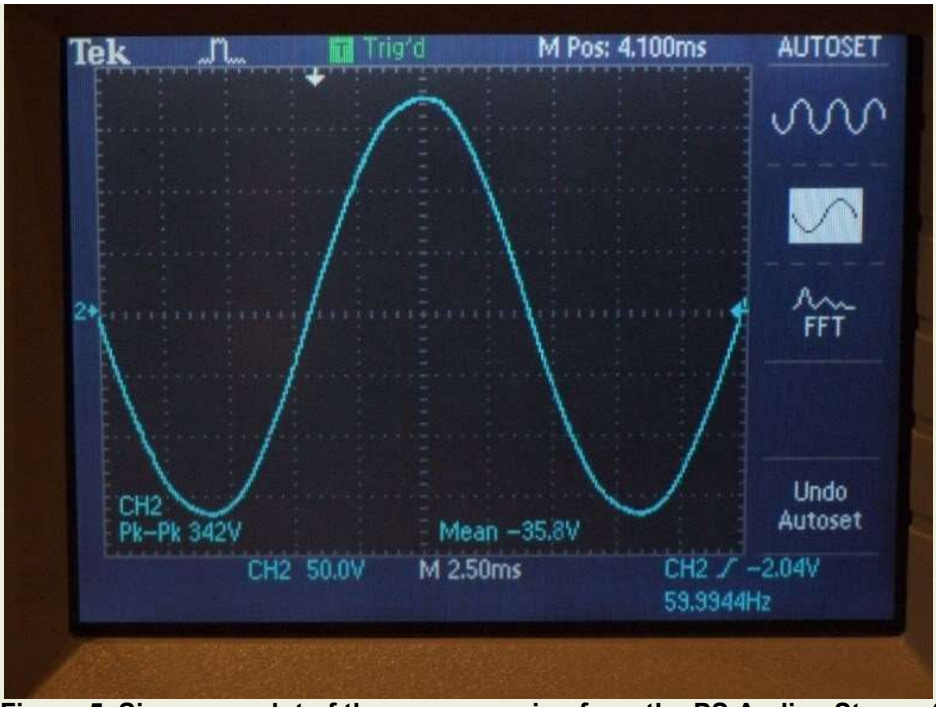

Figure 5. Sine wave plot of the power coming from the PS Audio xStream Statement SC amplifier power cord.

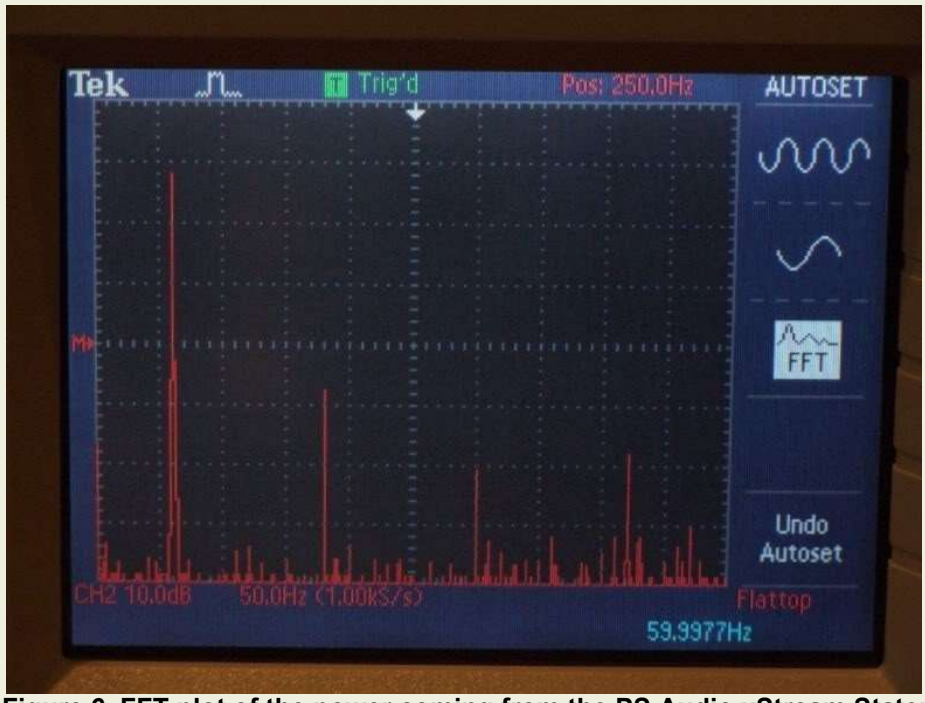

Figure 6. FFT plot of the power coming from the PS Audio xStream Statement SC amplifier power cord.

The sine wave plots of the power coming from the wall socket, stock amplifier power cord, and Statement SC amplifier power cord all look virtually identical. When we look at the FFT plots, we see some differences. Compare the FFT plot of the power coming from the Statement SC power cord (figure 6) to the FFT plot of the power coming from the stock power cord (figure 4). Remember, everything except for that big 60 Hz spike on the left is **NOISE**.

Now, compare the FFT plot of the power coming from the Statement SC power cord (figure 6) to the FFT plot of the power coming from the wall (figure 2). The power coming from the Statement SC cord has less noise density at 60 Hz than the power coming from the wall.

Between the signals shown in figures 4 and 6, which would you prefer to send to your power amplifier? Some would say it does not matter. According to the conventional "wisdom", the higher noise content of the stock amplifier power cord does not matter because the amplifier's power supply filters with take care of it the way that Master Windu "took care" of Jango Fett.

We'll see.

Measurements Of Noise At The Power Amplifier Outputs

As stated previously, a test CD was used to input a 60 Hz signal to the power amplifiers. The signal path was as follows:

Cary Audio CD 306 SACD Pro SACD player --> Audioquest Sky XLR 1.5m Interconnects --> Pass Laboratories X0.2 Preamp --> Audioquest Sky XLR 1.0m Interconnects --> Parasound Halo JC 1 Power Amplifiers --> Tektronix TDS 2012 Oscilloscope (Left Channel)/Polk Audio SDA SRS (Stereo Dimensional Array Signature Reference System) 1.2TL loudspeaker (Right Channel). The left speaker cables were disconnected from the amplifier.

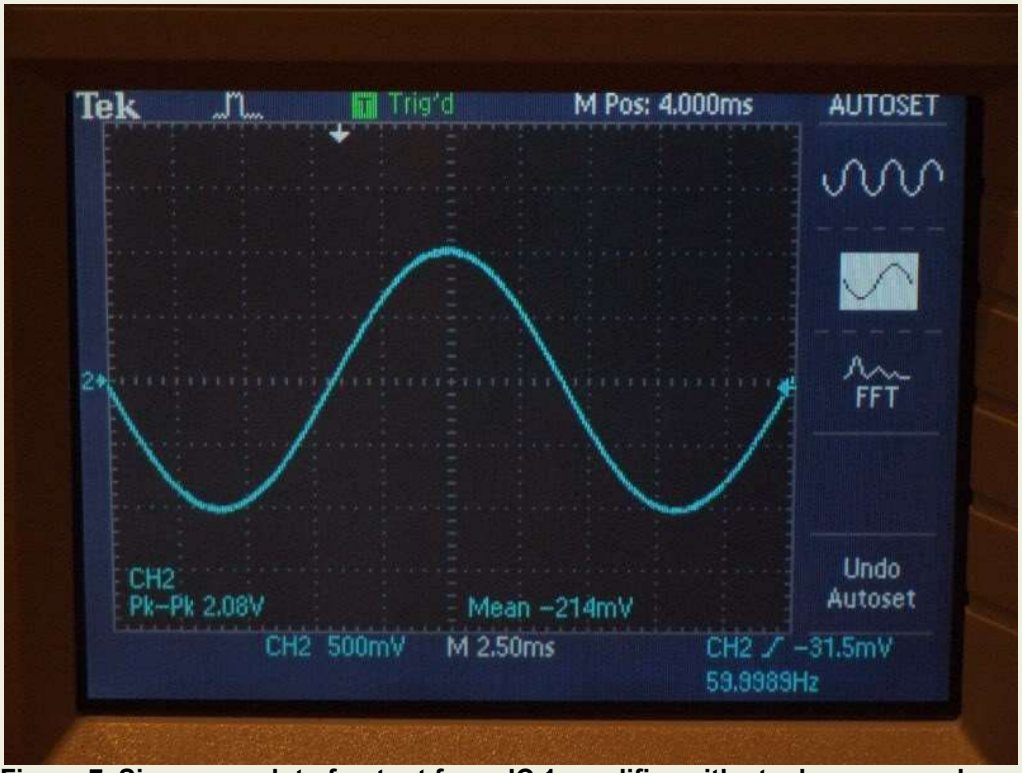

Figure 7. Sine wave plot of output from JC 1 amplifier with stock power cord.

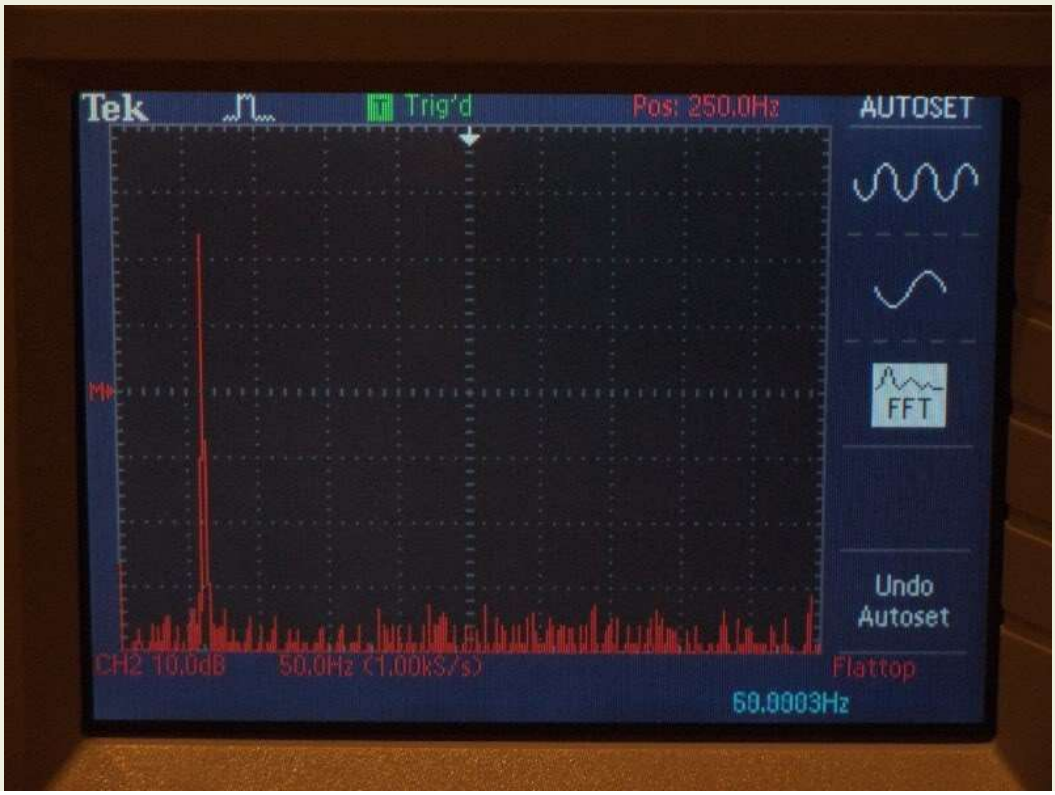

Figure 8. FFT plot of output from JC 1 amplifier with stock power cord.

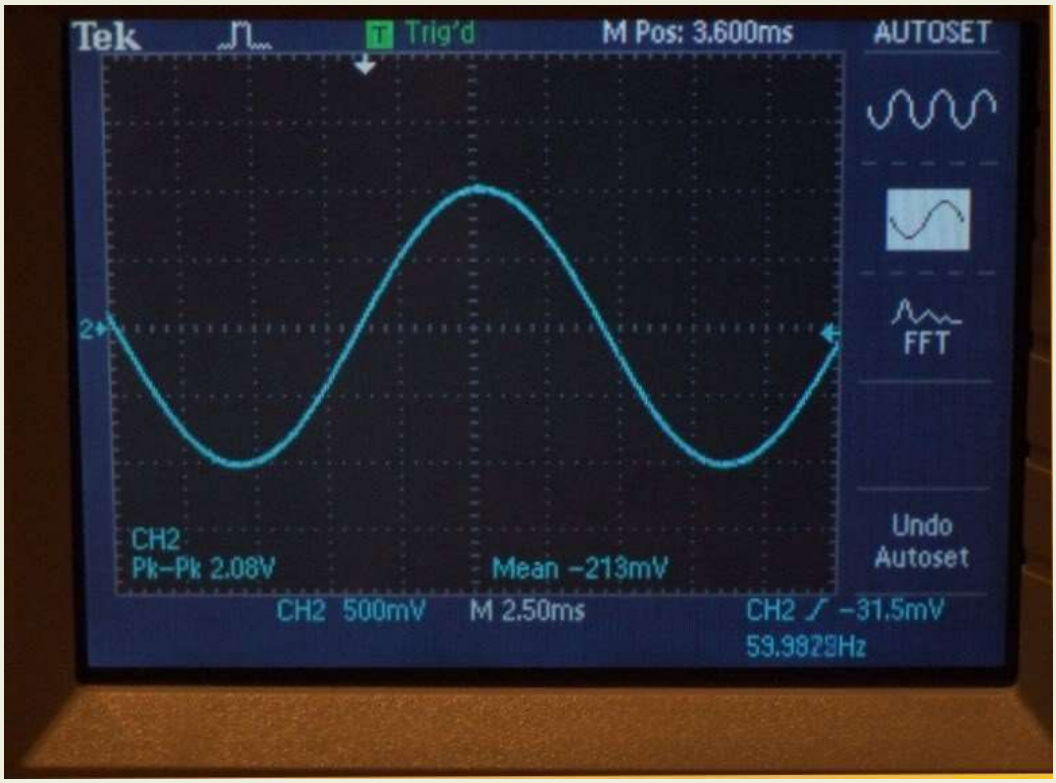

Figure 9. Sine wave plot of output from JC 1 amplifier with Statement SC power cord.

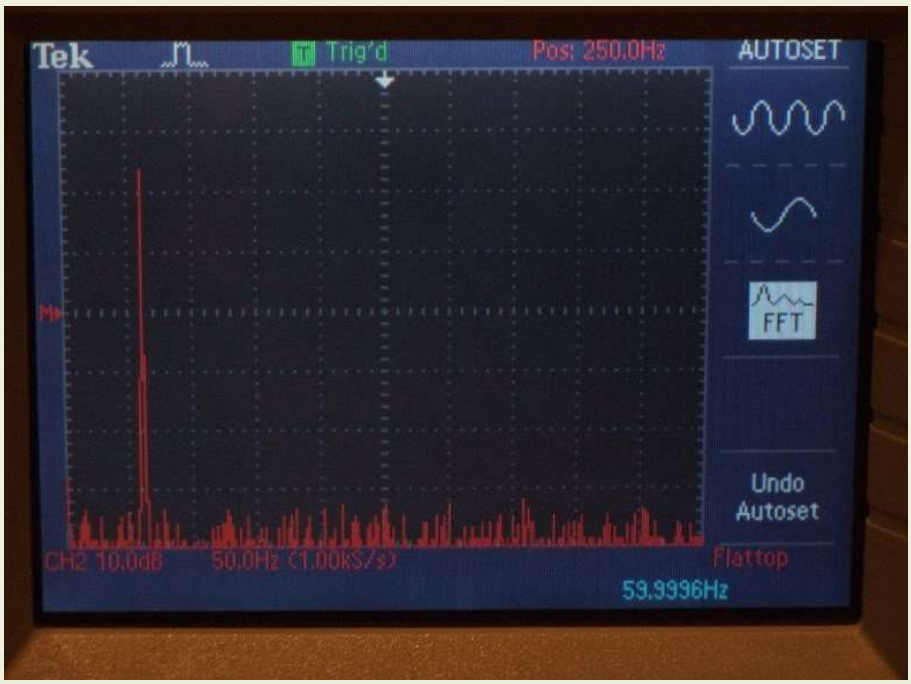

Figure 10. FFT plot of output from JC 1 amplifier with Statement SC power cord.

The sine wave plots of the 60 Hz signal taken at the left amplifier's outputs are virtually identical for the stock power cord and the Statement SC power cord (figures 7 and 9). I imagine that some audio enthusiasts would take these plots and go somersaulting down the yellow brick road while screaming "see, we told you cables didn't make a difference". However, before we go traipsing down those bricks, we should take a moment to look at the frequency domain plots. There may be some gremlins that did not show up in the time domain plots.

The spectral plots for the amplifier outputs with the stock and Statement power cords are shown in figures 8 and 10. Both plots look very good and provide evidence that the JC 1 does an excellent job of cleaning the power signal. The main difference between the FFT plots is that there is a bit less noise congestion around 60 Hz. If you copy both figures to your imaging software and flip between them or if you print them out and compare them, you will also notice a little less noise congestion throughout the frequency range.

Perhaps the stock power cord would suffice if the amplifier's outputs could send their signals to the loudspeakers without an intervening medium. Unfortunately, the signal has yet another gauntlet to run: ***the trip through the speaker cables***.

Measurements Of Noise At The Loudspeaker Inputs

The left speaker cable was reconnected to the amplifier and the 60 Hz tone was feed to both speakers. The oscilloscope was connected to the inputs of the left speaker. Sine wave and FFT plots were obtained, first with the stock power cord attached and then with the Statement SC power cord attached.

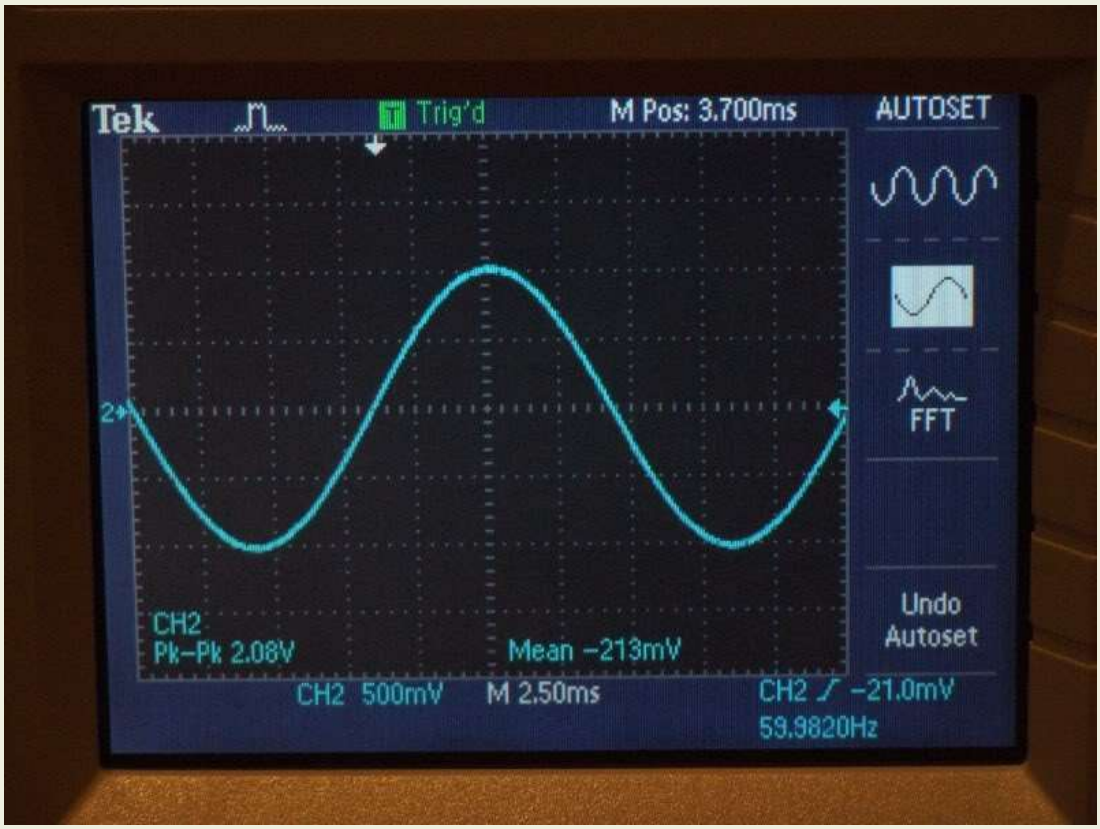

Figure 11. Sine wave plot at input of left speaker with stock power cord.

Figure 12. FFT plot at input of left speaker with stock power cord.

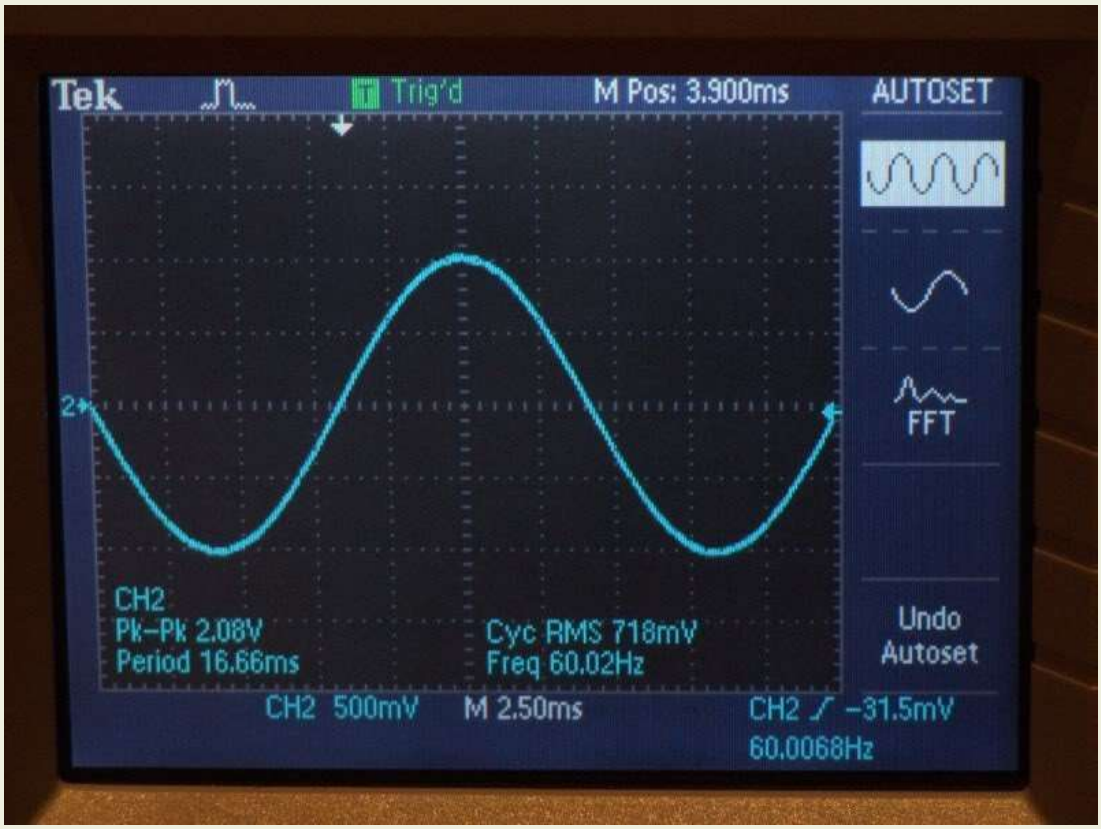

Figure 13. Sine wave plot at input of left speaker with Statement SC power cord.

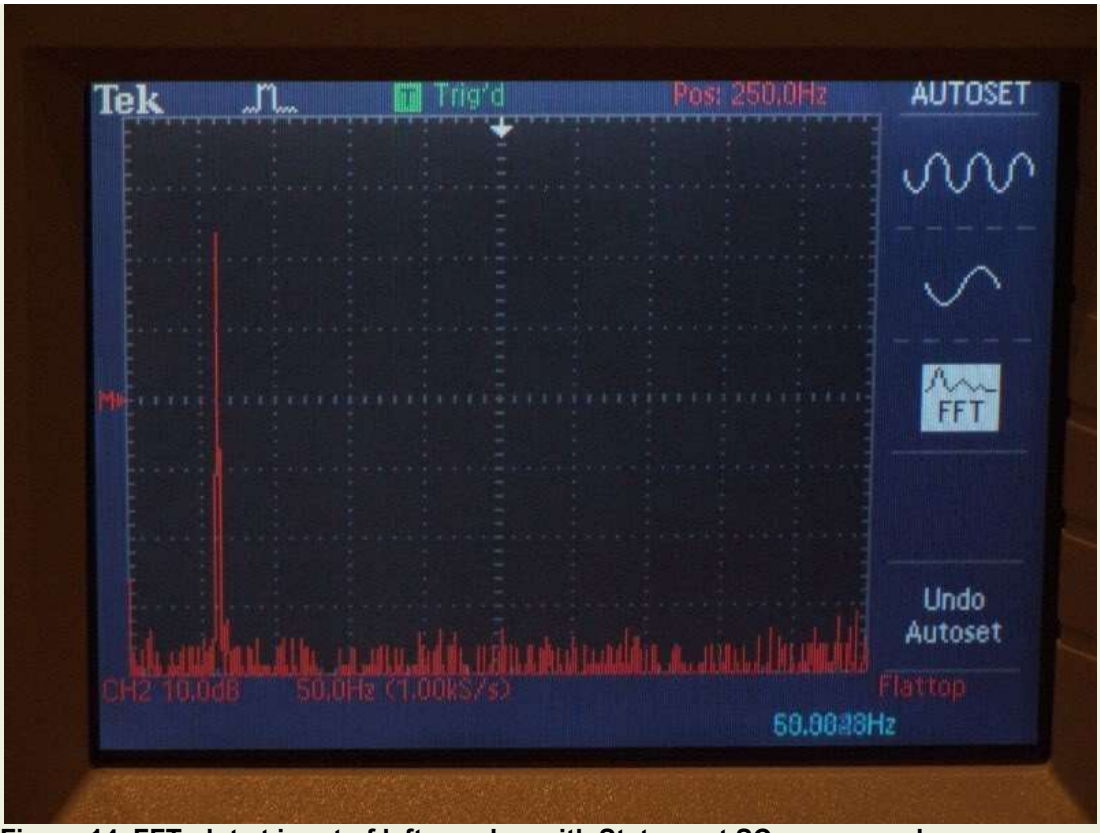

Figure 14. FFT plot at input of left speaker with Statement SC power cord.

Do we even need to discuss figures 11 and 13? Can we just go directly to figures 12 and 14? Thanks.

If you copy figures 12 and 14 and flip between them, you will see an increase in the noise density throughout the frequency range. You will also see an average 4 dB increase in noise magnitude. That means over twice as much noise power was being dumped into my extensively modified and esteemed SDA SRS 1.2TL speakers with the stock power cord than with the Statement SC power cord. Such a increase in noise power obscures a lot of musical and imaging detail. Bear in mind that the Audioquest Everest speaker cables are a very low noise design. In the future, I will look at the noise figures for some of my other speaker cables. However, I am not quite brave enough for that at this time.

Another thing to consider is that all speaker cables have noise in the conductors. The noise in the signal can interact with the noise in the cable and rob the signal of musical detail and imaging. It is evident that minimizing the noise entering an amplifier's power supply minimizes the noise that is output at the amplifier's output. Subsequently, less noise is available to interact with the speaker cable's noise **and** less cumulative noise is available to be dumped into the speaker terminals...and our ears.

1. Studies On Residential Power Line Noise - Part 2 - Continued

Discussion Of Results

The small differences in noise power between the amplifier outputs with the stock and Statement SC cables would not appear to be of immediate concern when comparing figures 8 and 10. However, we see that after the higher noise signal passes through the speaker cable, it looks disproportionately worse than the lower noise signal.

While comparing the stock power cable's amplifier output signal FFT (figure 8) with its speaker input FFT (figure 12), we see a substantial increase in noise around 60 Hz and throughout the entire frequency spectrum.

While comparing the Statement SC's amplifier output signal FFT (figure 10) with its speaker input FFT (figure 14), we see a general **flattening** of the entire noise spectrum with a moderate increase in noise density throughout. Even a small amount of noise prevention can reap big rewards further down the audio chain. Conversely, the introduction of even a small amount of noise can have **disproportionately** damaging effects further down the audio chain.

It was interesting to "fall back" and listen with the stock power cords. It was not unpleasant, but I was very surprised at the amount of musical details on familiar recordings that went missing. I was constantly listening for details that were either hard to hear or simply weren't there anymore. The sound stage shrank quite a bit also. :(

Conclusion

If a power cable introduces objectionable noise while reproducing a simple 60 Hz waveform, how much worse will noise proliferate when the amplifier is reproducing a complex music signal?

Future Study

The next noise study will evaluate the effects of regenerated 60 Hz, 120 volt power with that coming directly from the wall.

Do you like looking at FFT plots? Are they pretty?

Addendum-Digital Line Noise, Or Lack Thereof

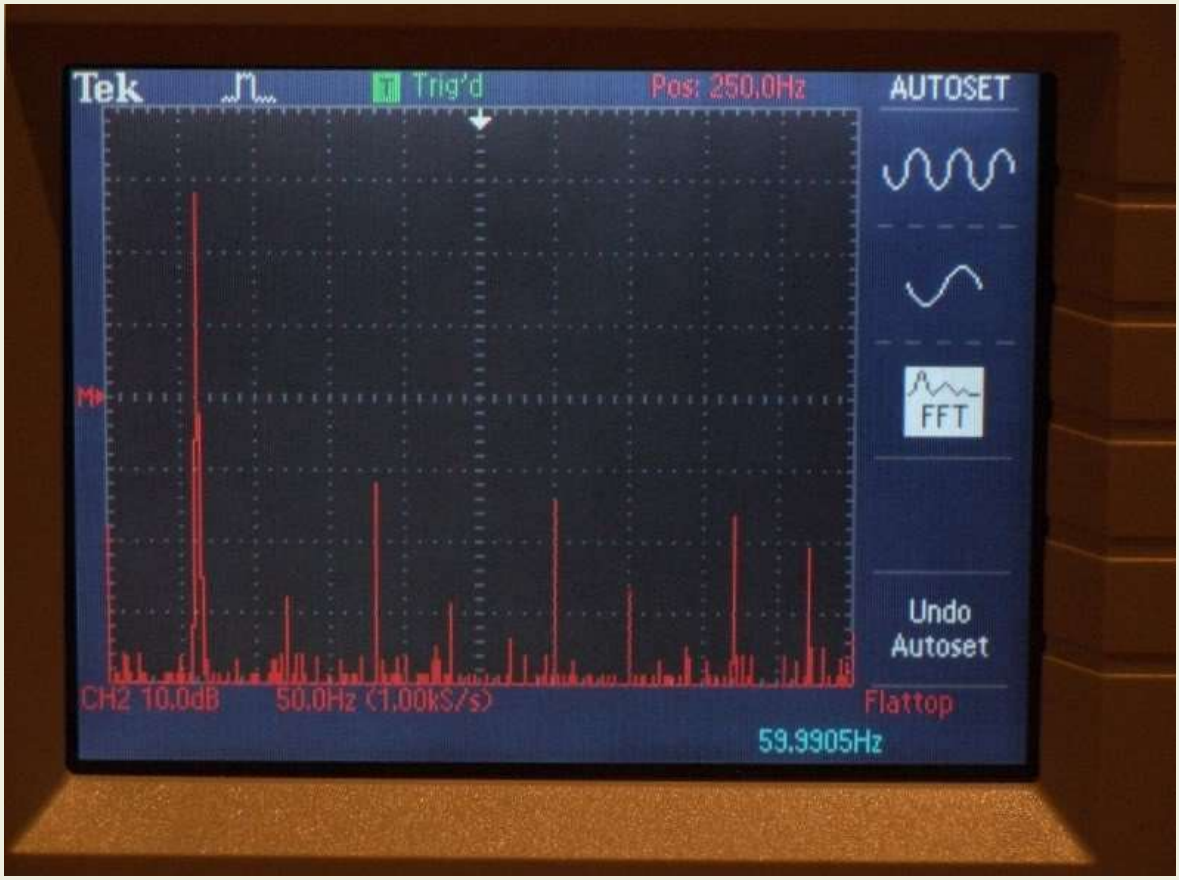

Figure 15. FFT of Statement SC power output with SACD player unplugged.

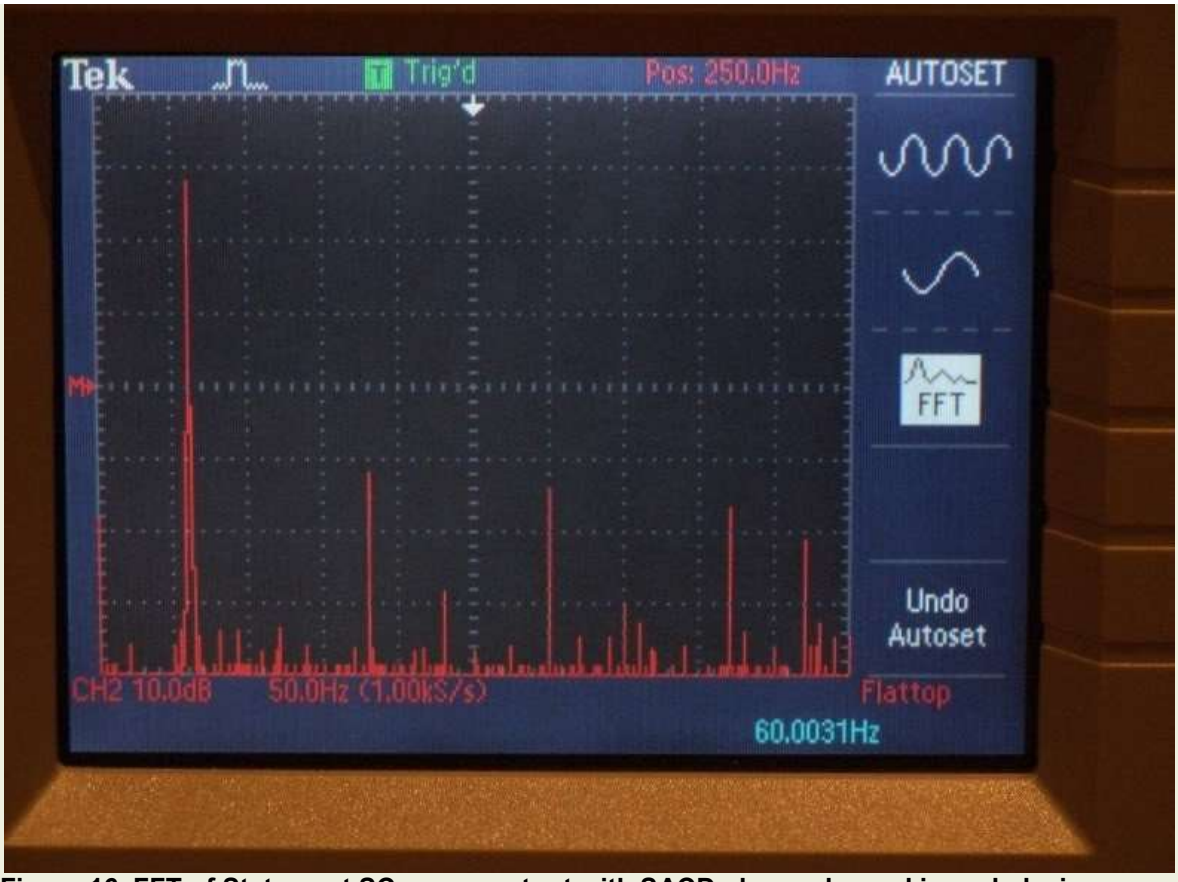

Figure 16. FFT of Statement SC power output with SACD player plugged in and playing.

Digital devices are supposed to be notorious for dumping noise back on to power lines. I was curious to see what my Cary Audio CD 306 Pro SACD player was doing in that regard. Oddly enough, the noise on the power line ***decreased*** when the SACD player was turned on. I expected the noise figure to increase when the SACD player started playing but it did not. I repeated this five times and the results were the same. Therefore, either there was no change in the noise figure when the SACD player was turned on and engaged or the change was too small or of a nature that could not be detected by my oscilloscope. The SACD player and right power amp are the only components on the right dedicated audio circuit. The preamp, phono preamp, turntable battery charger, and left power amp are on the left dedicated audio circuit.

I sent figures 15 and 16 to Cary Audio's engineering department and asked for their explanation. This is the response I received:

"Seems to me you have a ground loop and when the CD 306 SACD PRO is added to your system this is reducing this noise you are describing."

My response to their response:

"Ok, but why would simply turning on the CD 306 Pro reduce the background noise on the AC line? It seems like the noise should increase when another component is added."

Cary's second response:

"Not necessarily. That is the funny thing about ground loops they do not respond the way you think they should. The short explanation to this is when you introduce another component to your system it may or may not change the potential difference between ground of the circuit in relation to the potential difference to the other components. This may help in explaining what is occurring in your system.

Actually, I would have preferred the long explanation, but I did not press further.

Other measurements revealed that the preamp and phono preamp do kick back a small amount of noise onto the power line. The phono preamp is noisier than the preamp. The turntable battery charger did not generate any noise that I could detect.

Disclaimer

Please don't misunderstand my intent for publishing this report. There is no need for anyone to puff up their chest and tell me that Statement SC's are not the be all and end all of power cables and that there are other good cables out there. I know that. The Statements are not even the best that PS Audio makes. I am merely reporting on the noise characteristics of **my** components and cables at **my** house. Someone else may have superconducting liquid nitrogen cooled cables with spectral noise figures that look like a blank sheet of paper. If so, good for them. I'd love to read about it. There's lots of great gear in the market place to suit everyone's taste and budget.

Part 3

1. Studies On Residential Power Line Noise - Part 3- PS Audio Power Plant Premier

Introduction

In this report, the effects of a power line conditioner, the PS Audio Power Plant Premier, is evaluated. Part 1 of this series is here. Part 2 is here.

There are many options available to the audio/video enthusiast for power conditioning. Most of these products are designed for commercial, professional audio, and laboratory applications. Many are considerably less expensive than the "audiophile/videophile" power conditioning products offered by such companies as PS Audio and Shunyata. Others are much more expensive. Typically, the audiophile/videophile oriented power conditioners offer a range of features, convenience, and aesthetic appeal that is unavailable, at any price, from products oriented toward the commercial, professional audio, and laboratory markets. The PS Audio Power Plant Premier (PPP) has an MSRP of $2195. It can be found on the used market for as low as $1000. There are high quality commercial power conditioning products that will do basically the **same thing** the PPP does for hundreds less than the PPP's lowest used market price. Unfortunately, most of the commercial class power conditioners have little to no aesthetic appeal and would become eye sores if placed in any type of residential living space. Aside from the aesthetic drawbacks of commercial class power conditioners, which can be considerable, there may also be issues with heat generation and noise. After all, the manufacturers of these products did not have the audiophile and videophile in mind when designing them. The high performance audio and video market is far too small of a niche to be of interest to such companies.

Figure 1. The Power Plant Premier was a welcome functional and aesthetic addition to my home audio system. It made a significant improvement in my system's spatial rendering performance.:)

Ergonomics

The PPP is a low profile 17" wide component and is available in black or silver face. It can be placed on a standard audio equipment rack shelf. It weighs 35 pounds and is ruggedly constructed. It has two quiet, bottom mounted fans which typically do not come on unless the PPP is stressed. In my home audio system, the four components connected to it (SACD player, preamp, phono preamp, and turntable battery charger) have a combined power draw of 140 watts and a combined current draw of 1.2 amps. Since this is less than 1/10th the 1500 watt capacity of the PPP, I don't expect that the fan will ever come on while in operation, although the fans do spin briefly when the unit is first turned on.

The owner's manual is well written and is printed on high quality gloss enamel paper and illustrated with color photographs.

The PPP is plugged into one of the outlets on the original dedicated audio circuit. It shares that circuit with my wireless networking equipment. Two additional dedicated 20A circuits serve the Parasound Halo JC 1 amplifiers.

You might think that placing the PPP between two class A idling amps would be stressful due to the heat generated. Fortunately, the heat coming off the JC 1's heat sinks flows straight upward. The space between the amps is at room temperature. In fact, I have to place my fingertips as close as 1/4 inch from a heat sink side in order to feel any heat radiation, even though their idling temperature is 108 degrees. Of course, the space above the heat sink stays toasty warm. The sides of the PPP remain cool at all times. The vented center portion of the case top remains at 94 degrees at all times, no matter how long or how hard I run the system. I ran the PPP fully loaded in my home theater system for over an hour and the case top only reached 103 degrees. That was 1 degree cooler than the idling temperature of my home theater preamp/processor.

Figure 2. I did not like the relatively dim numeric voltage display.

The PPP features an alpha-numeric display that shows input and output voltage, input and output total harmonic distortion, and a few other things. The display is actually dimmer than it appears in figure 2. The brighter appearance is due to the long exposure time (4 seconds) of the photograph. The center portion of the display where the numbers appear is very dim compared to the words (e.g. "input", "output") that appear in areas around the center portion of the display. I initially thought something was wrong with my unit's display because all the advertising photos show the center numeric display to be bright. Perusing the PS Audio forums revealed that other purchasers had the same concern and that the numeric display is designed to be dimmer than the words. PS Audio does not give a reason for this.

Figure 3. I see you. The "secret" trim pot for adjusting output voltage (the little blue thing).

I am not a big fan of "hidden" features. In fact, I despise them. The PPP is adjusted at the factory to provide the appropriate output voltage (120v/230v). The output voltage can be adjusted, if necessary, by turning tiny potentiometer on the case bottom near the front. This potentiometer is not mentioned in the manual. Its location and function is discussed on the PS Audio forums. The voltage for North American models can be increased up to a maximum of 135 volts. Maybe PS Audio didn't mention it out of concern that some people, possessed of a "more is better" mentality, would want to set the output voltage on 135 thinking that if 120 volts is good, 135 volts must be better.

The output voltage of my PPP would fluctuate between 120 and 121 volts when first turned on, then settle down to 121 volts. I did not feel compelled to fiddle with the trim pot because my house voltage is usually 121 volts.

The display functions can be accessed/changed by the remote control. The unit can also be turned on and off from the remote.

Test Procedure

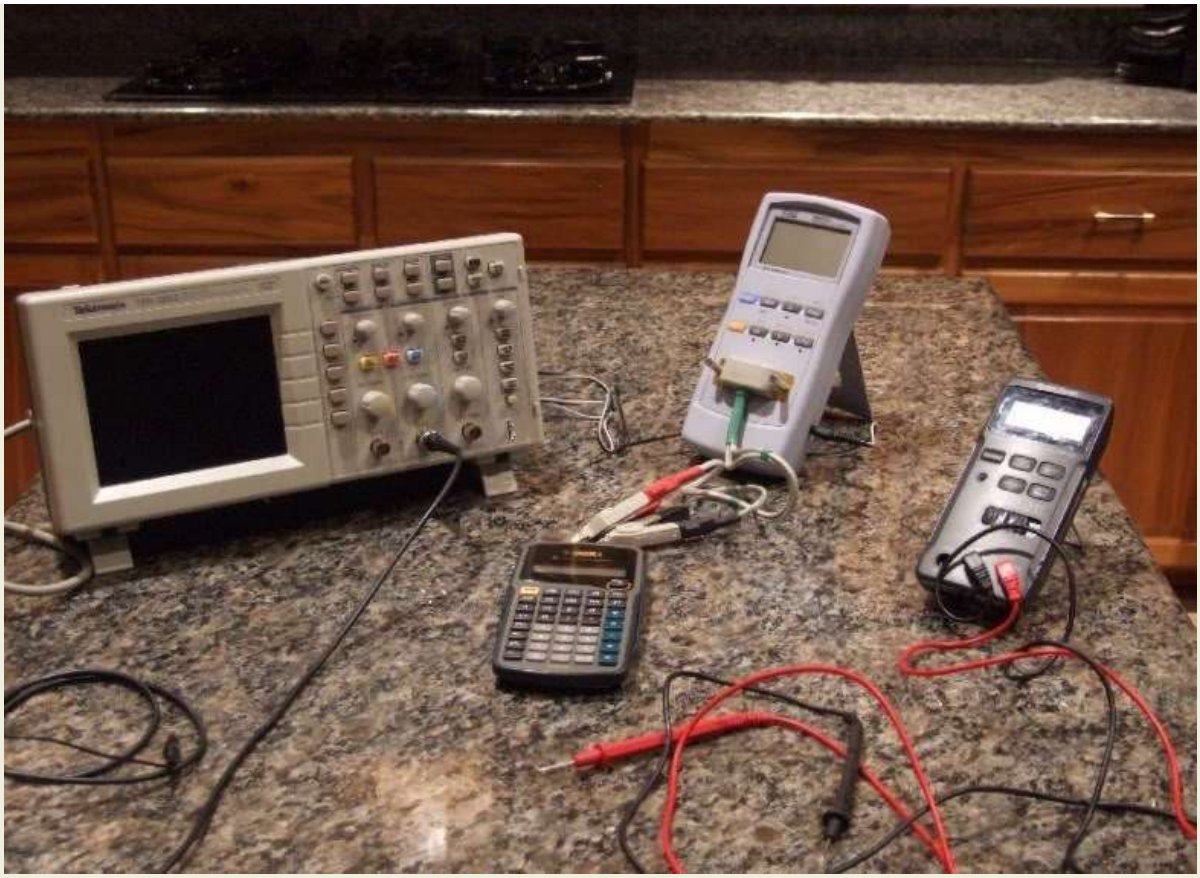

Figure 4. Come on in Mr. Power Plant Premier. We've been expecting you.

Input and output power waveforms were evaluated with a Tektronix model TDS 2012 oscilloscope. The PPP was first evaluated in my home theater system and then in my home audio system. Each vertical dot on the Fast Fourier Transform (FFT) plots represents 10 dB of magnitude. Each horizontal dot represents 10 Hz of frequency.

Figure 5. This is actually a picture of me being mean.

The plasma TV, Blu-ray disc player, preamp/processor, and three power amps were plugged into the PPP. Those six devices represented a total potential power load of 1525 watts. This was 25 watts over the PPP's maximum power spec. The Blu-ray version of "Casino Royale" was used to evaluate audio and video quality.

The home theater system is on a dedicated 20A circuit. There are 15 other devices on the circuit: plasma television, thirteen devices in the HT equipment cabinet, and the powered subwoofer across the room. When watching movies, only the three power amps (Adcom GFA-5500's), TV, Blu-ray player, preamp processor, and subwoofer are on. I really need to add another dedicated circuit.:(

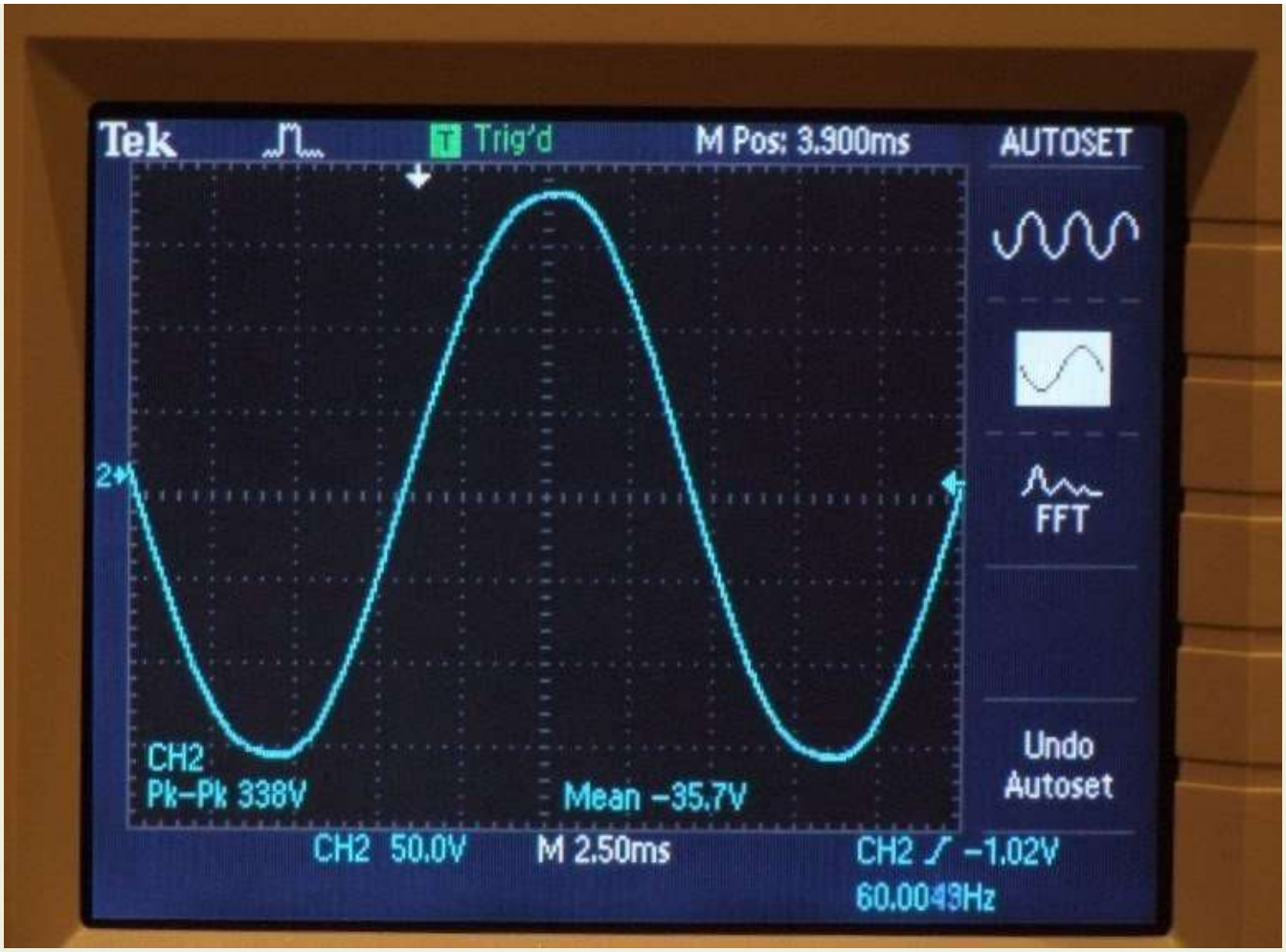

Figure 6. Sine wave plot of the power coming out of the wall with all HT components turned off.

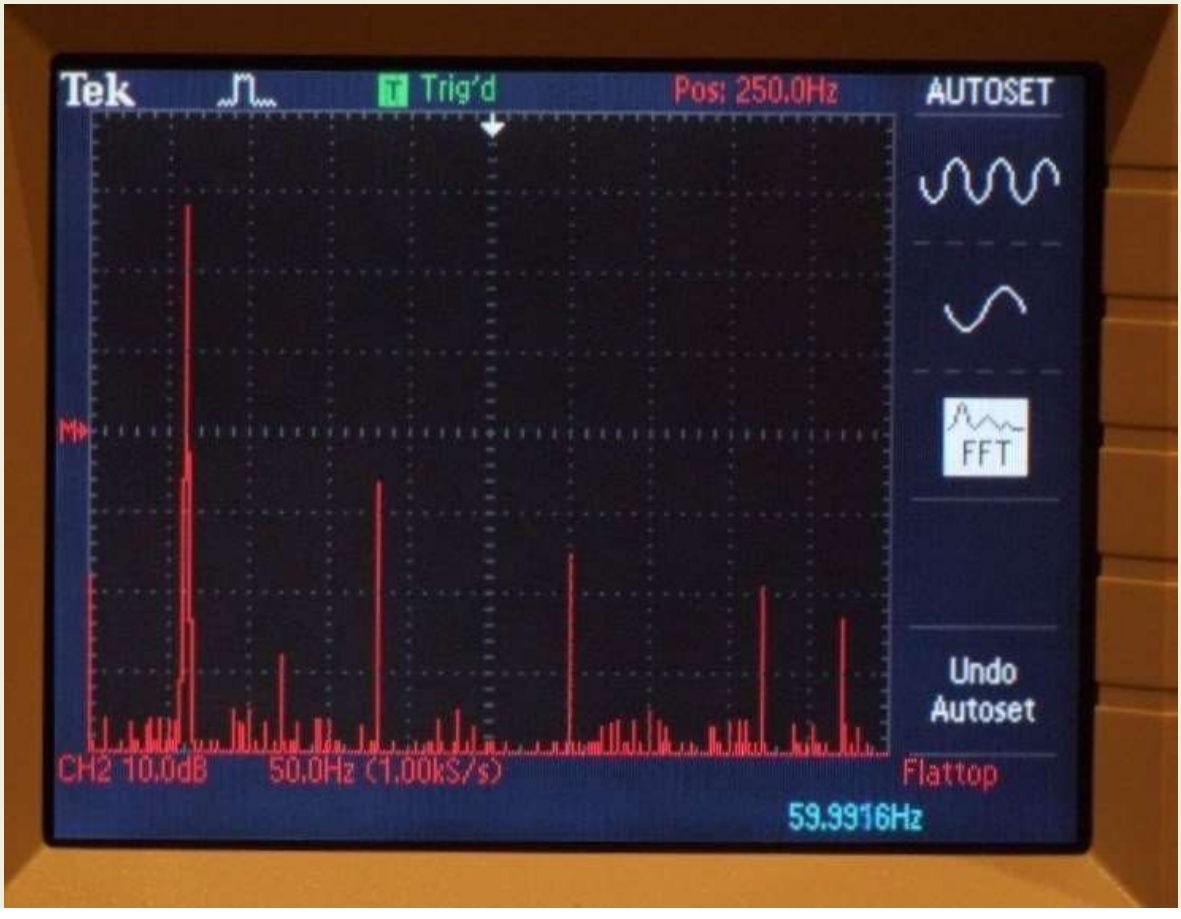

Figure 7. FFT plot of the power coming out of the wall with all HT components turned off.

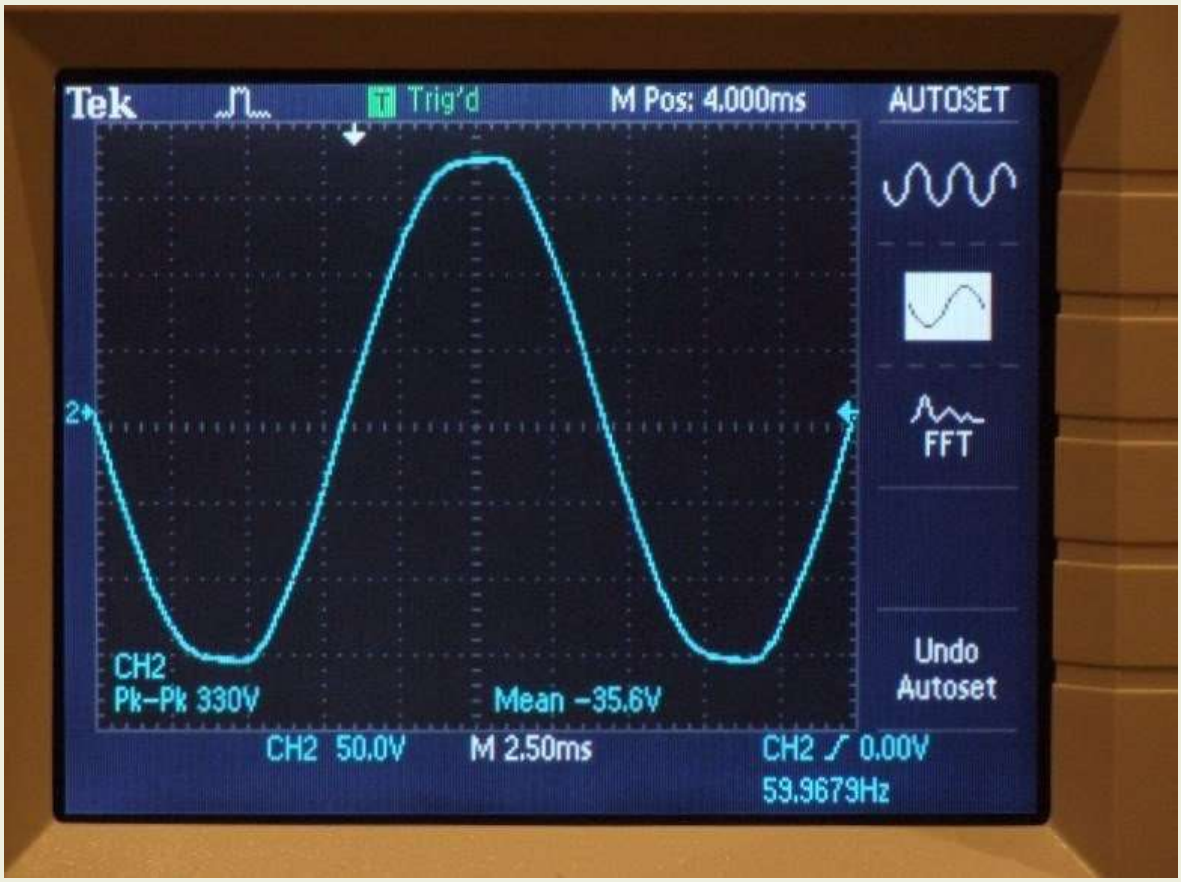

Figure 8. Sine wave plot of the power coming out of the wall with all HT components turned on and playing. Voltage would dip down as low as 117 volts.

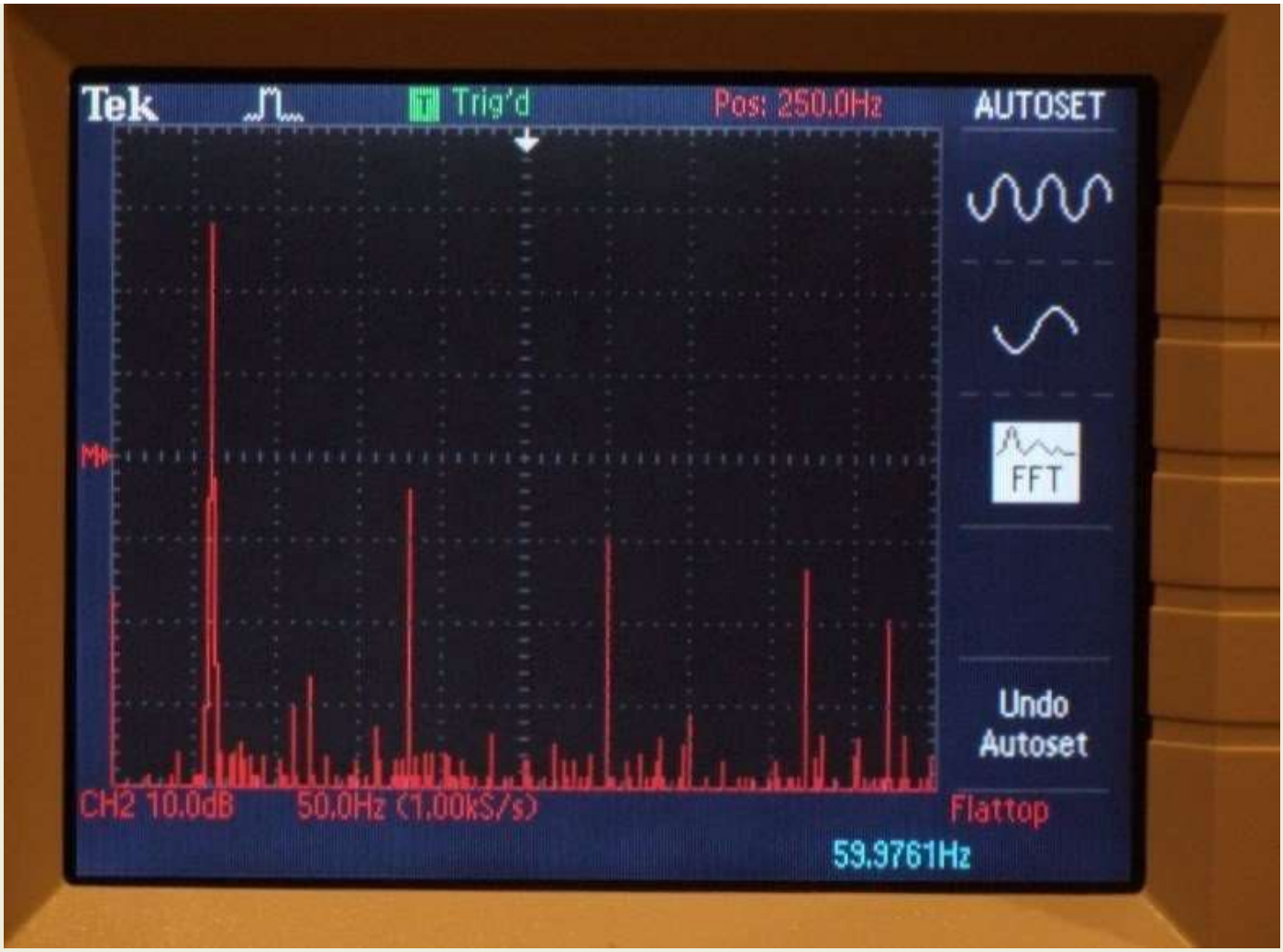

Figure 9. FFT plot of the power coming out of the wall with all HT components turned on and playing.

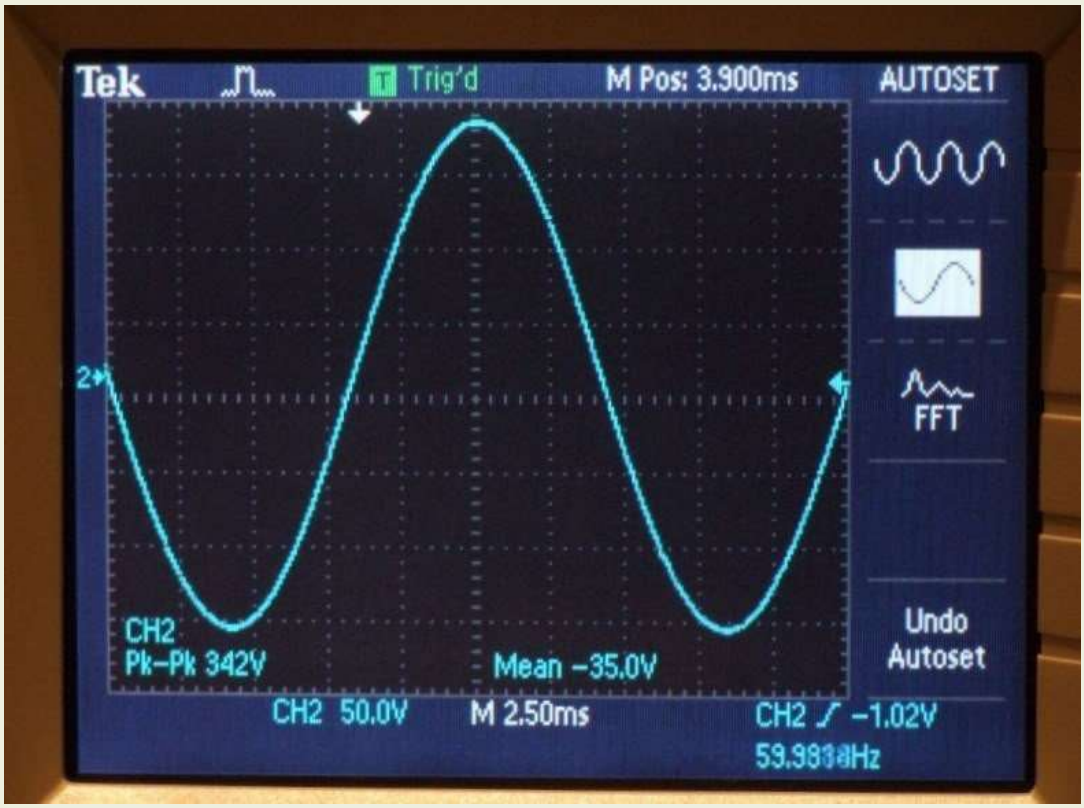

Figure 10. Sine wave plot of the PPP's output with HT equipment on and playing.

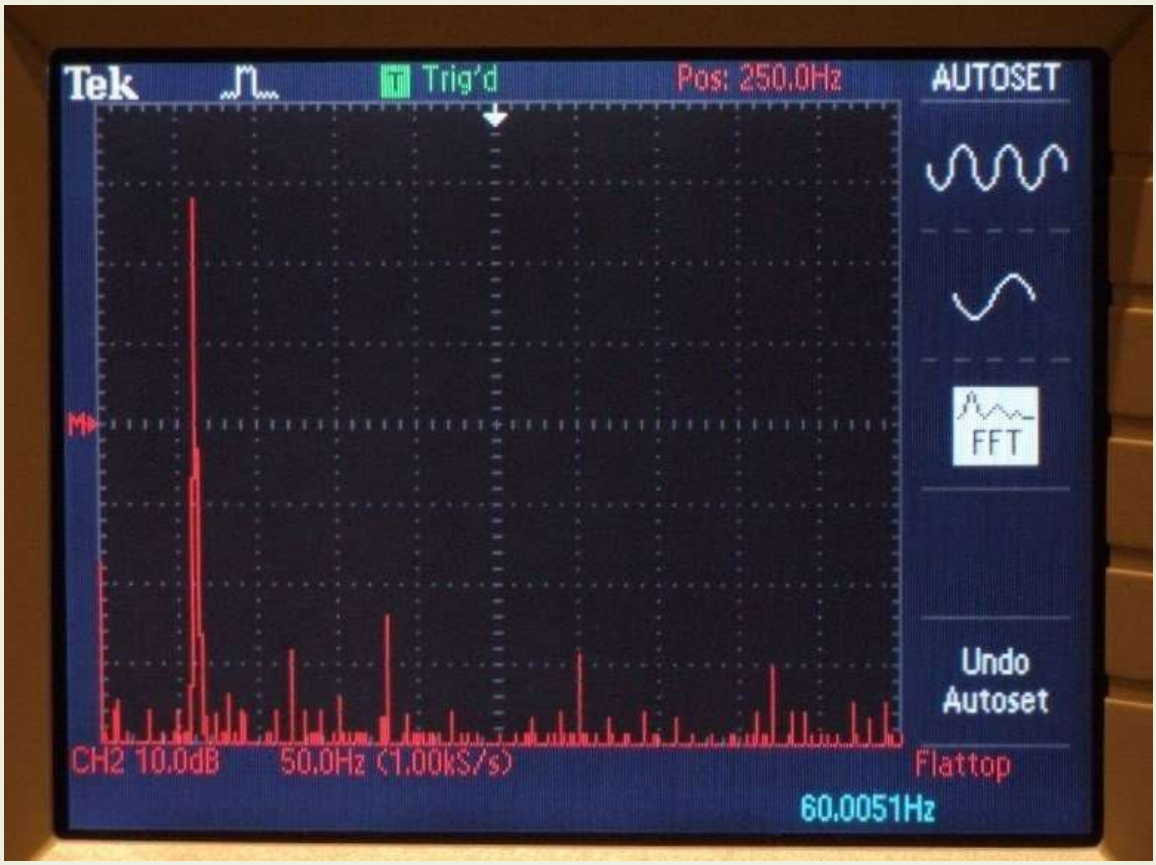

Figure 11. FFT plot of the PPP's output with HT equipment on and playing.

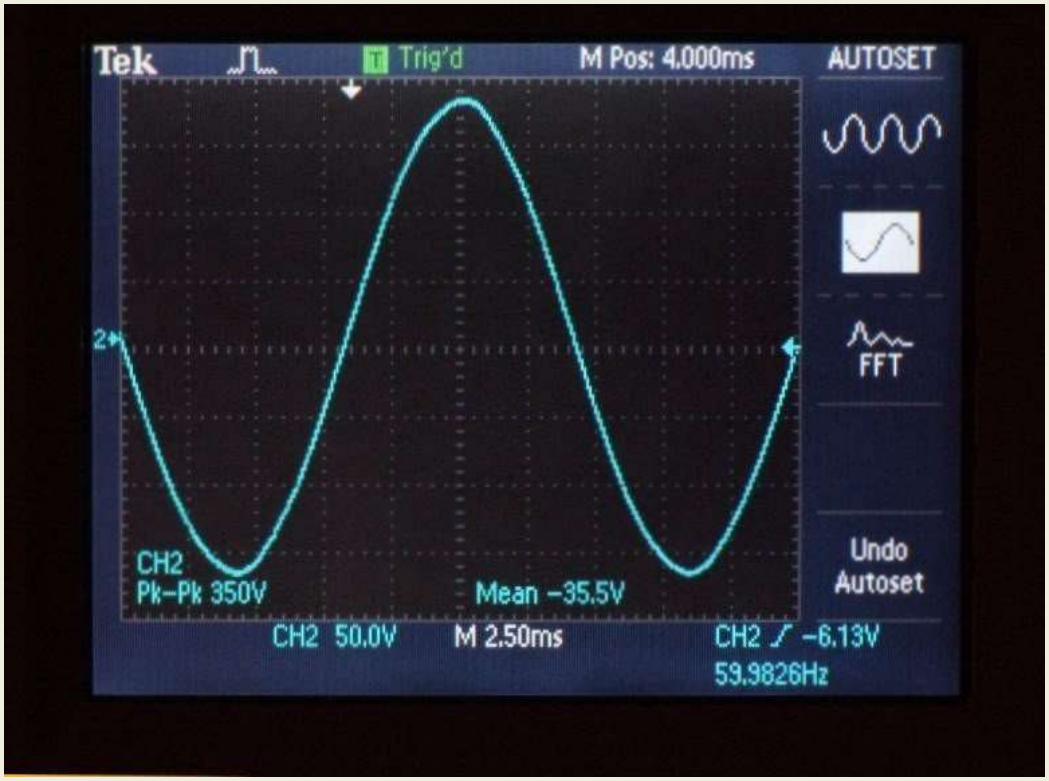

Figure 12. Sine wave plot of the PPP's output during an explosion scene from "Casino Royale".

Figure 13. FFT plot of the PPP's output during an explosion scene from "Casino Royale".

Discussion Of Home Theater Test Results

Turning on all of the HT gear resulted in severe deformation of the sine wave peaks (figure 8) due to harmonic distortion. Comparing the FFT plots in figures 7 and 9, we see a 2 dB increase in the DC component, a 2 dB increase in the 3rd harmonic, a 5 dB increase in the 5th harmonic, a 6 dB increase in the 7th harmonic, and a 3 dB increase in the 470 Hz utility company control tone. In addition to the significant increase in noise magnitude there was also an increase in noise density.

1. Studies On Residential Power Line Noise - Part 3- Continued

Figures 10 and 11 show the sine wave and FFT plots at the output of one of the PPP's outlets. The sine wave is near perfect in shape. The FFT plot shows a drastic reduction in noise magnitude and density. Comparing the FFT plot of the power going into the PPP (figure 9) with the power coming out (figure 11) we have the following magnitudes:

Power In From Wall-
DC component: 0.69v
Fundamental 60 Hz frequency: 117.48v
120 Hz 3rd Harmonic frequency: 2.82v
300 Hz 5th Harmonic frequency: 1.36v
420 Hz 7th Harmonic frequency: 0.93v
470 Hz control tone: 0.45v

Power Out To Components-
DC component: 0.20v
Fundamental 60 Hz frequency: 121.62v
120 Hz 3rd Harmonic frequency: 0.29v
300 Hz 5th Harmonic frequency: 0.17v
420 Hz 7th Harmonic frequency: 0.14v
470 Hz control tone: 0.09v

The 3rd harmonic was reduced nearly 10 times (9.7X). The PPP's distortion meter showed total harmonic distortion of 2% for the wall power and 0.2% for the PPP's output power when the HT equipment was turned off. The PPP's distortion meter showed total harmonic distortion of 4.1% for the wall power and 0.4% for the PPP's output power when the HT equipment was turned on and running.

PS Audio recommends that the PPP be placed on a dedicated circuit if other audio or video components not connected to the PPP are on the circuit. The PPP increases the noise and harmonic distortion on the circuit it is attached to. The harder the PPP has to work, the more distortion and noise it will dump on the power line. While running my HT system, the harmonic distortion on the power line doubled.

The PPP's fan came on 20 minutes after the movie began playing and stayed on until two of the power amps were turned off. The case temperature rose to 103 degrees while under stress. The case temperature was 92 degrees while idling on the floor with the HT equipment turned off. Room temperature was 75 degrees. The movie's dialog completely obscured the fan noise from my seating position 13.5 feet away. If I came to within 6 feet of the PPP while dialog was playing, I could hear a soft "whooshing"I sound. Even if I muted the HT system's sound while the fans were running, the fan noise was not objectionably loud. However, I have read complaints on the PS Audio forum about loud fan noise on earlier PPP's. People shopping for a PPP on the used market should inquire about any issues with fan noise.

Home Theater Video And Audio Quality

I did not see any improvement in video quality with the PPP regardless of the picture source (high definition TV channel, standard DVD, or Blu-ray disc).

The improvement in audio quality was fantastic, even for the TV. Until this evaluation, I wasn't even aware that my TV's speakers could produce any bass. They certainly didn't produce any in the two and a half years I have owned the TV. As soon as the TV came on, I heard a fuller, richer sound coming from the speakers, and that was just with a hi def television program playing. Engaging the subwoofer along with the TV's speakers resulted in really nice sound. With the TV running off the PPP, I could actually stand to watch a movie with just the TV speakers running. :)

The TV speakers were muted and the sound for Casino Royale was played through the 5.1 speaker system from the beginning.

The roaring MGM lion was reproduced with a clarity and wealth of rumbling undertones that were previously unavailable on my HT system.

When Bond first confronts the Prague section chief at the beginning of Casino Royale he makes this remark:

"M really doesn't mind you earning a little money on the side Dryden. She'd just prefer if it wasn't selling secrets."

There was a subtle malevolent rumble in Bond's voice that I had never heard before. It was mildly reminiscent of Darth Vader's voice.

I needed to turn the volume down 4 dB from the usual volume setting because of the real and perceived increase in volume due to the lowered noise floor.

The percussive power of the gunshots during the bathroom scene was startling.

The sound coming from the surround speakers sounded louder and better integrated with the front stage. There was more of a sense of being immersed in a thick, cohesive, detailed 360 degree sound field.

Reluctantly, after I had watched an hour and fifteen minutes of Casino Royale, it was time to power down and listen under the old regime. The fans slowed down drastically two minutes after two of the amps were turned off. The fans turned off completely after 12 minutes. I turned off the HT components and plugged everything back into the wall. The difference was like going back from a high performance turbo charged engine to the same engine, yet normally aspirated.:(

I really had no intention of purchasing a PPP for my HT system and only evaluated it there out of curiosity. I purchased a PPP, in black finish, for the HT system the next day. I will see if I can "get by" just running the TV and source components through the PPP and plugging the amps into the wall. The part of my brain that is not in denial is already bracing for the wallet ding of a second PPP and two additional dedicated outlets. I'll let the subwoofer have the original dedicated circuit to itself.

I'm glad that PS Audio had enough aesthetic sensitivity to make the PPP available in black and silver faces. If they were only available in black, I would not have bought one for my audio system. If they were only available in silver, I would not have bought one for my home theater system. I'm shallow like that.

Figure 14. Imagine the aesthetic dissonance that would be caused by installing a silver faced PPP here.

I sure have learned a lot about power infrastructure planning for my next house.

The Main Event: Evaluation of Power Plant Premier In Audio System

The residential grade receptacle on the left outlet of the original dedicated audio circuit was replaced with a PS Audio Power Port receptacle.

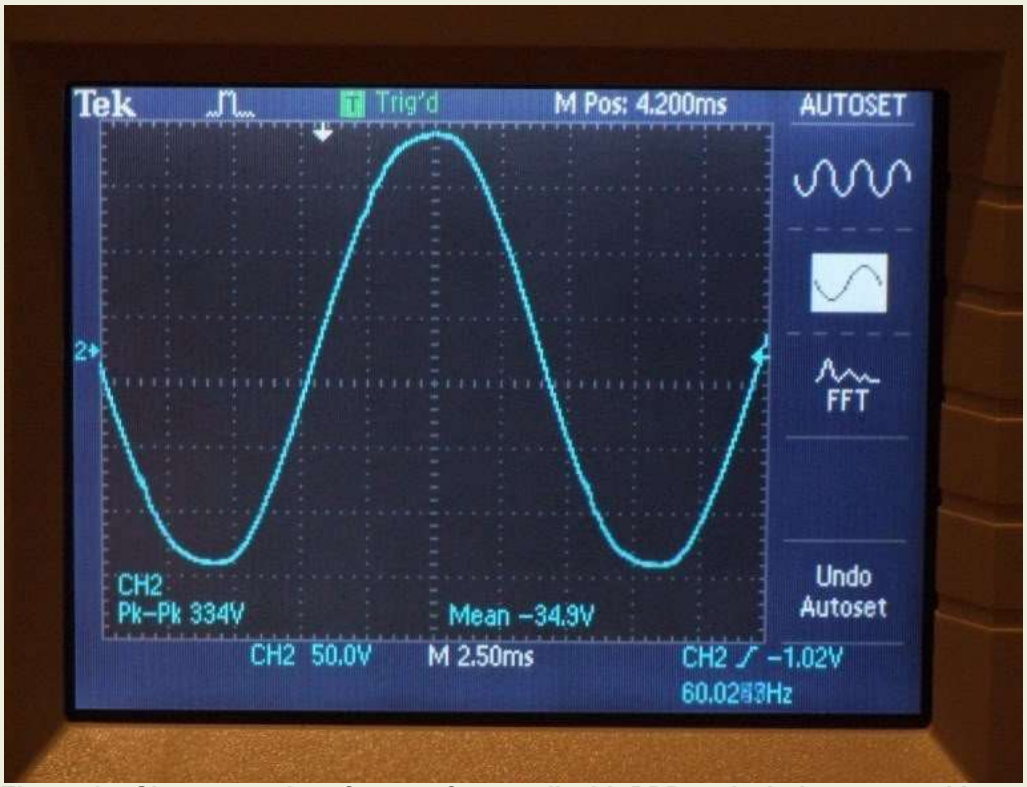

Figure 15. Sine wave plot of power from wall with PPP and wireless networking

gear plugged in. Audio system preamps and source components are plugged into the PPP.

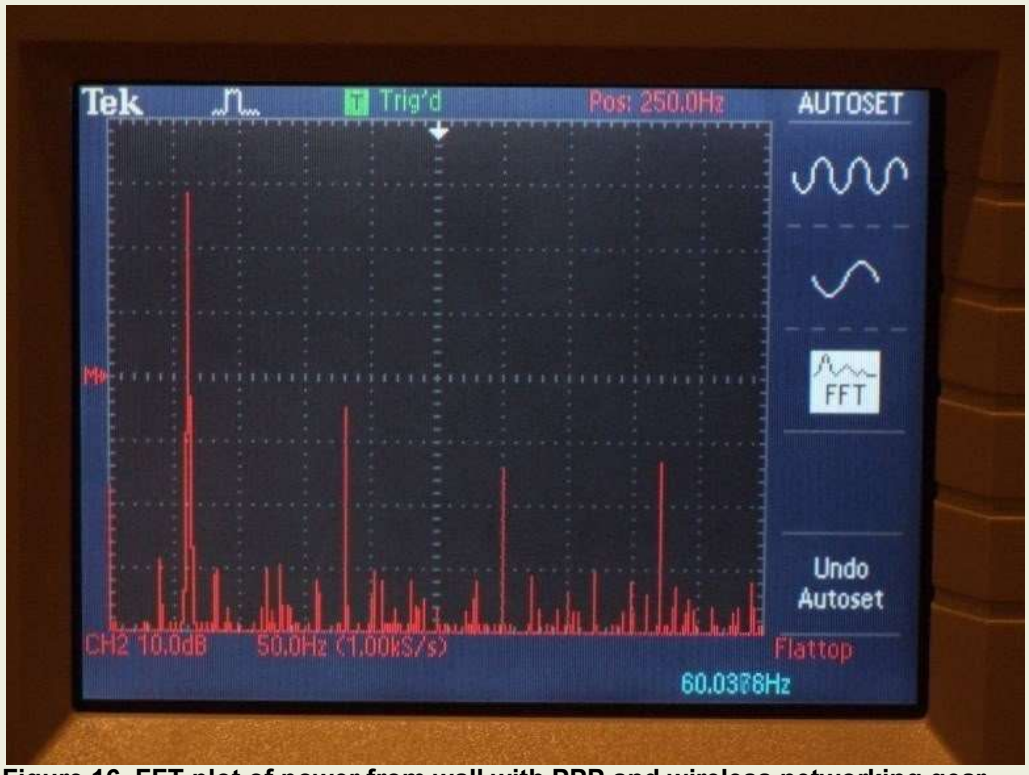

Figure 16. FFT plot of power from wall with PPP and wireless networking gear plugged in. Audio system preamps and source components are plugged into the PPP.

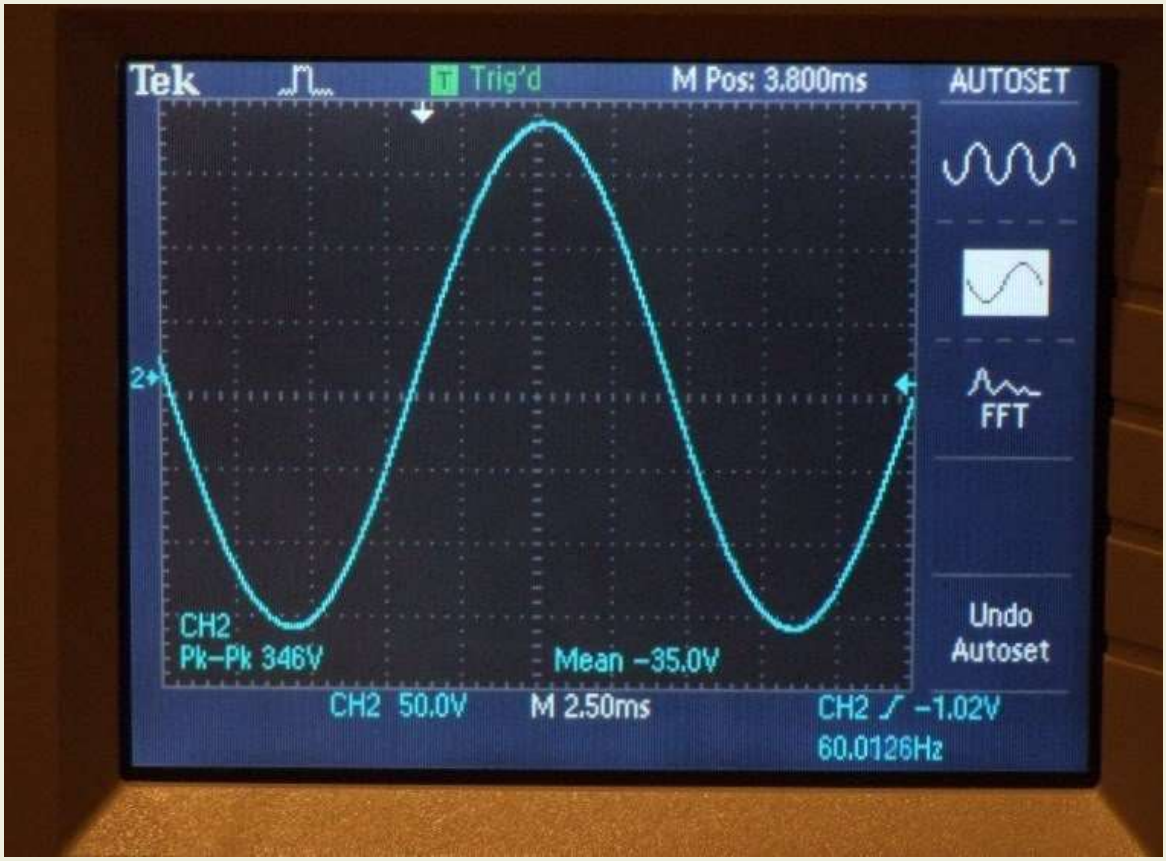

Figure 17. Sine wave plot of the power coming from the PPP.

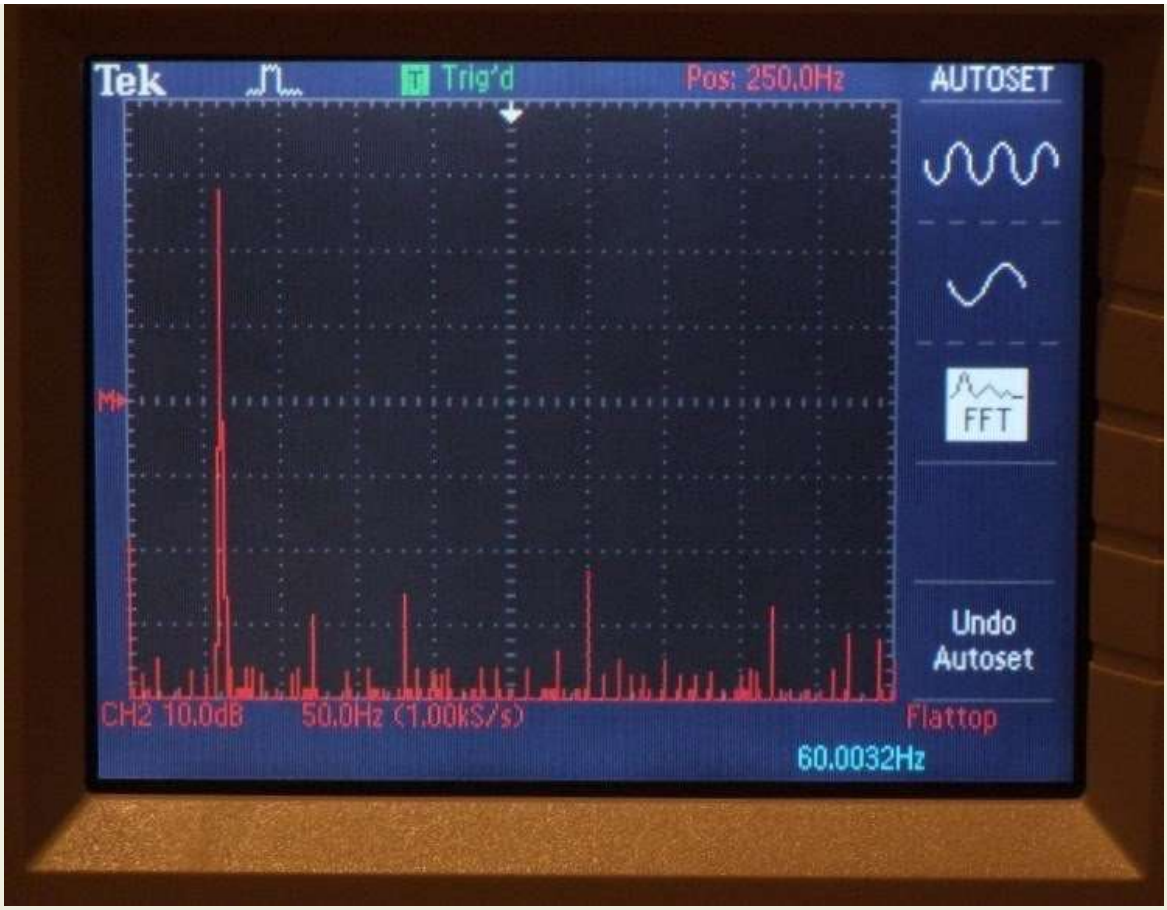

Figure 18. FFT plot of the power coming from the PPP.

Figures 15-18 show the differences in the wall and PPP output power. Note the extreme reduction in noise density and magnitude (figs. 16 and 18). The PPP measured 3% incoming total harmonic distortion and 0.3% outgoing.

In part 2 of this series, a 60 Hz test tone was measured at the input of the left speaker. The same 60 Hz tone was measured with the PPP powering the preamps and source components. Figure 20 (FFT with PPP) shows a significant reduction in noise density and magnitude around 60 Hz compared to figure 21 (without PPP). The magnitude of noise in the area of the 470 Hz utility company control tone was also significantly reduced. The DC component was reduced by 2 dB.

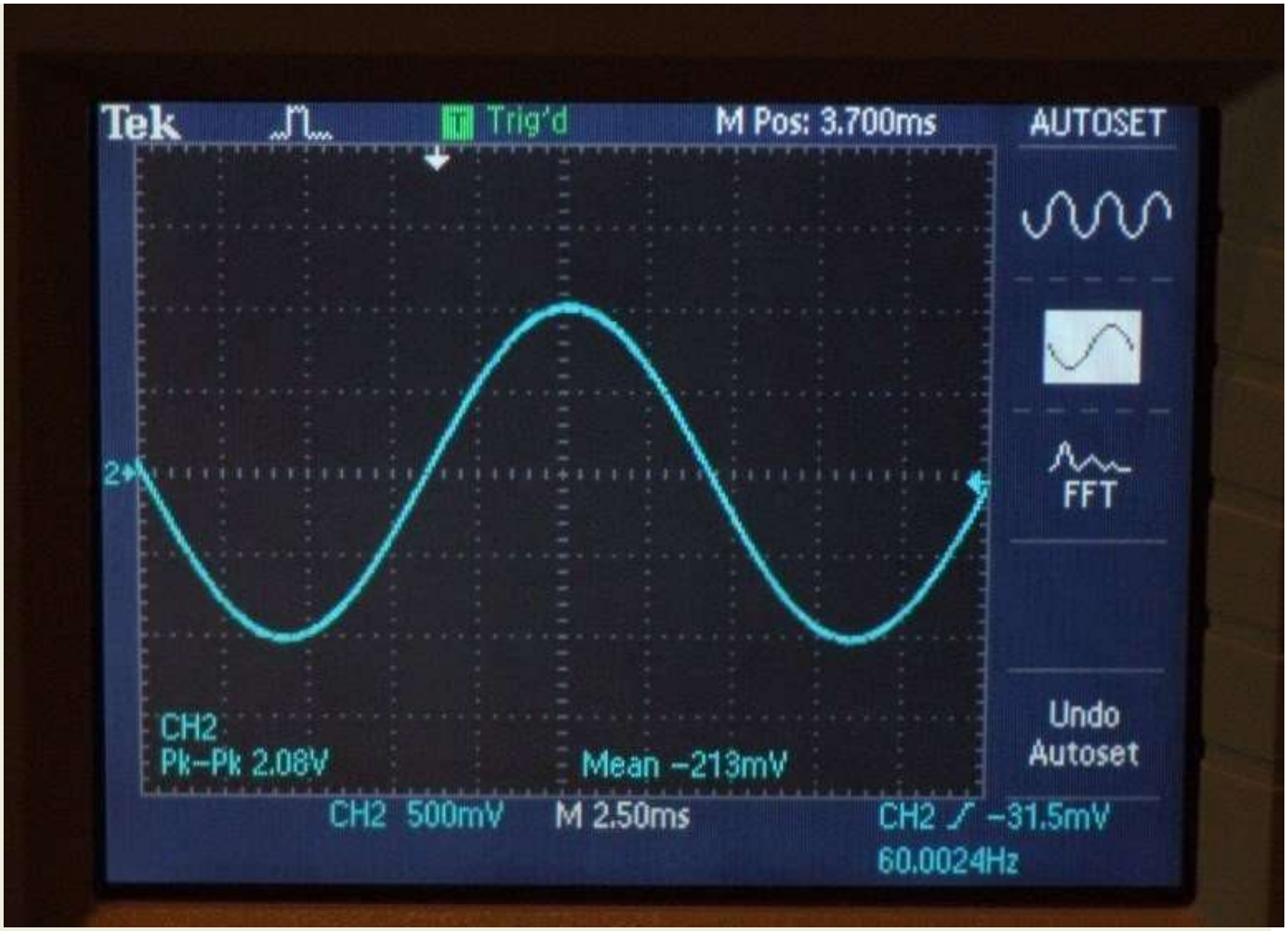

Figure 19. Sine wave plot of 60 Hz test tone at input of left speaker with PPP.

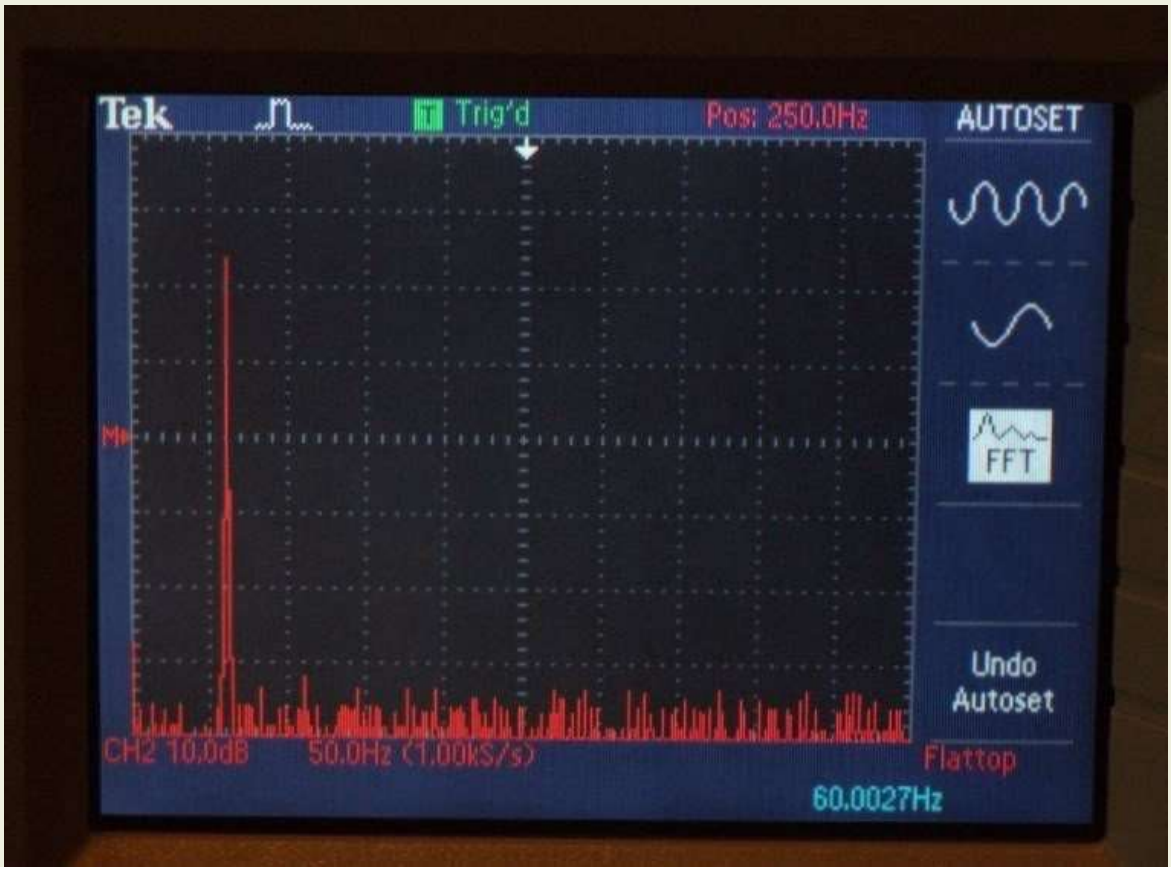

Figure 20. FFT plot of 60 Hz test tone at input of left speaker with PPP.

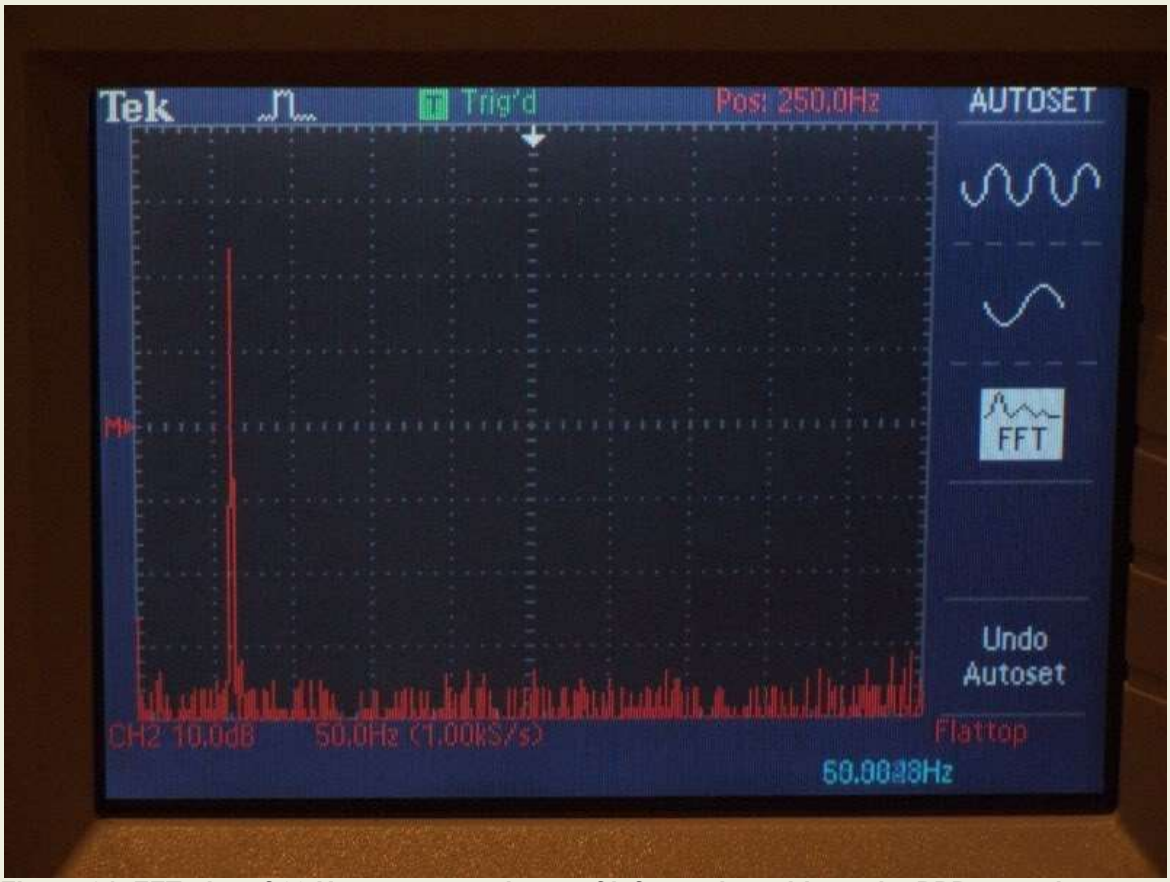

Figure 21. FFT plot of 60 Hz test tone at input of left speaker without the PPP powering source components and preamps.

1. Studies On Residential Power Line Noise - Part 3- Continued

Discussion of Results

I thought the introduction of the PPP would be like going from a stock power cord to a high performance cord. It was more like upgrading to a bigger, more powerful amp.

Feeding the source components and preamps a cleaner power signal resulted in a cleaner music signal being fed to the power amplifiers and the speakers. I heard the following differences immediately.

1. The sound grew louder, apparently and measurably. I used to listen with the preamp set at 29 for an average SPL of 90 dB-C. I now get the same SPL with the preamp set at 26. A volume setting of 29 is now too loud.

2. The sound stage grew a little (about 1 foot) in all three dimensions. There was more of a sense of thick layering of sound in music tracks that were mixed that way (e.g. a layer of synthesizer background, over which are multiple layers of percussion sounds, over which are the principal instruments, over which are the vocals).

3. **Bass**, **Bass**,**Bass**,**Bass!** Bass is larger, sharper, tighter, more articulate, more tactile, and simply....more.

4. More clarity overall. Like going from a 100 watt light bulb to a 150 watt bulb.

5. Sharper, faster, transient response. Most noticeable on hot drum licks.

6. More liquidity in the midrange and high frequencies. Most noticeable on acoustic and electric guitars and saxophones.

7. The largest increase in weight of individual sound stage images of any "tweak" to date.

8. More recording space ambiance.

Further Study

I have been advised by Parasound to abjure forevermore the thought of putting anything, except a power cord, between the JC 1's and the wall. Based on how the PPP reacted to the three GFA-5500 amps in my home theater system, I did not plug my JC 1's into it. Furthermore, I had been advised by PS Audio that if I wanted to run a JC 1 in high bias mode off a PPP, I would need a PPP and a dedicated 20A circuit per JC 1. Reading about the experiences of other PPP owners who have tried it with high powered amps (>300 watts per channel) have not been encouraging. So, the JC 1's are going to stay connected directly to the wall, for now.

I am curious to hear how much would be gained by further improvements in the connection between the wall and JC 1. To that end, Part 4 will be an evaluation of the the present PS Audio Statement SC power cord against one claimed to be much, much better. We'll see.

Part 4

1. Studies On Residential Power Line Noise - Part 4- PS Audio Premier SC Power Cord

Introduction

PS Audio's best power cord, the xStream Premier SC, was evaluated against its second best, the xStream Statement SC.

Here are links to the previous parts of this series: Part 1, Part 2, and Part 3.

Figure 1. Two power line serpents face off.

Listening Evaluation Part 1 - Premier SC On Power Amps

A 2 meter Premier SC was compared to a 2 meter Statement SC's between my Parasound Halo JC 1 monoblock amplifiers.

Specs:

Effective Wire Gauge:Premier SC-7 AWG , Statement SC-8 AWG .

Construction: Premier SC-75% PCOCC* Copper, 25% Silver, Statement SC-PCOCC Copper. Both feature ferrite impregnated jackets with multiple shielding.

Weight: Premier SC-3.2 pounds, Statement SC-2.8 pounds.

Retail Cost (2m length): Premier SC-$1793, Statement SC-$629. The Premier is 2.85X the cost of the Statement.

The Premier SC took a while to settle down. Immediately after installation it was unpleasant to listen to: an overall veiled sound, bright "tizzy" highs, compressed sound stage height and depth, slow, muddy bass, diminished image weight and significant loss of bass tactility. The only good thing heard was the apparently louder sound which was evidence of a lowered noise floor.

After 8 hours, the tizzy highs were gone and the bass was more tactile, but the sound was still bad overall.

After 40 hours, I could stand to listen to my system again. I went back and forth between the Premiers and Statements and the Premiers had a bit more image weight and bass impact and the veiling and sound stage constriction was gone. At this point, I was not impressed and did not think the Premier's very modest sonic improvements justified their nearly 3X premium over the Statements.

70th hour-no change.

100th hour-no change. From my listening notes: ***"You're still not worth the extra money. Looking forward to sending you back."*** :)

124th hour. Things now get interesting when going back and forth between the Premiers and Statements. The Statements now sound veiled. I now hear more depth and previously unnoticed details with the Premiers. I put a Statement on the left amp and a Premier on the right amp. Images in the center were shifted slightly to the right with apparently much louder volume on the right. When I panned the balance control left to right, the sound pressure level meter registered the same for both sides, but the volume sounded significantly louder on the right. Some ambient information from the recording space was diminished or altogether missing on the left side. The Premier's bass was more tactile, heavier and articulate. With the Premiers on both sides, the sound stage was deeper with more layering and front to back space between images. The sound was more three-dimensional and holographic overall.

150th hour-no change. I decided to order 1.5 meter Premiers (for evaluation only :)) for the SACD player, line level preamp, and phono preamp. I wanted to find out if the Premiers would make a significant difference when placed between the Power Plant Premier regenerator and my source components and preamps.

268th hour-going back and forth between the Premiers and Statements again. I'm trying to find a reason to keep the Statements, but I can't. Diminishing returns did kick in: the cost differential was nearly 3X but my sound stage improved only 2X.

I speculated that there would be a minuscule, if any, improvement by replacing the Statement SC between the wall and the Power Plant Premier regenerator. PS Audio confirmed this. When the additional Premier SC cables arrived, I didn't bother to test my hypothesis.

Listening Evaluation Part 2 - Premier SC On Source Components and Preamps

There wasn't a lot of unpleasantness this time. Listening to my analog and digital sources revealed heavier, more tactile bass but with less detail and articulation, further lowering of the noise floor, a bit more depth, a bit lowered sound stage height and more clarity and detail in the treble, but not more brightness. I noticed that some recordings that had sibilant vocals were more pleasant to listen to and that the sibilance was gone on some of them. Drums had a more natural sound.

After 50 hours, I went back and forth with the Premier SC and Statement SC on the SACD player. With the Premier, I heard a big improvement in the rendering of piano and synthesizer. They both took on a thicker, fuller sound with more note decay. Transients of drum licks were sharper. Three-dimensionalism was more enhanced to the same degree as when the Premiers replaced the Statements on the power amps. The sound stage height reduction and small loss of bass detail and articulation that I initially heard was now gone.

More improvement, yet still with diminishing returns. The nearly 3X the cost but only 2X improvement ratio was maintained. I tried to rationalize sending the second batch of Premiers back, but I couldn't do it because they provided **$uch Good $ound**.

Figure 2. Ok...you win...for now.;)

Measurements

Noise spectrum measurements were taken after listening evaluations were completed.

The power spectrum (Fast Fourier Transform) plots from 0 Hz to 500 Hz for the wall socket, Statement SC, and Premier SC used with the right JC 1 amplifier are given in figures 3 through 5. Everything except the large 60 Hz spike on the left is considered to be nasty, filthy, **NOISE**. Each vertical square on the plots represents 10 dB of amplitude. Each horizontal square represents 50 Hz of frequency.

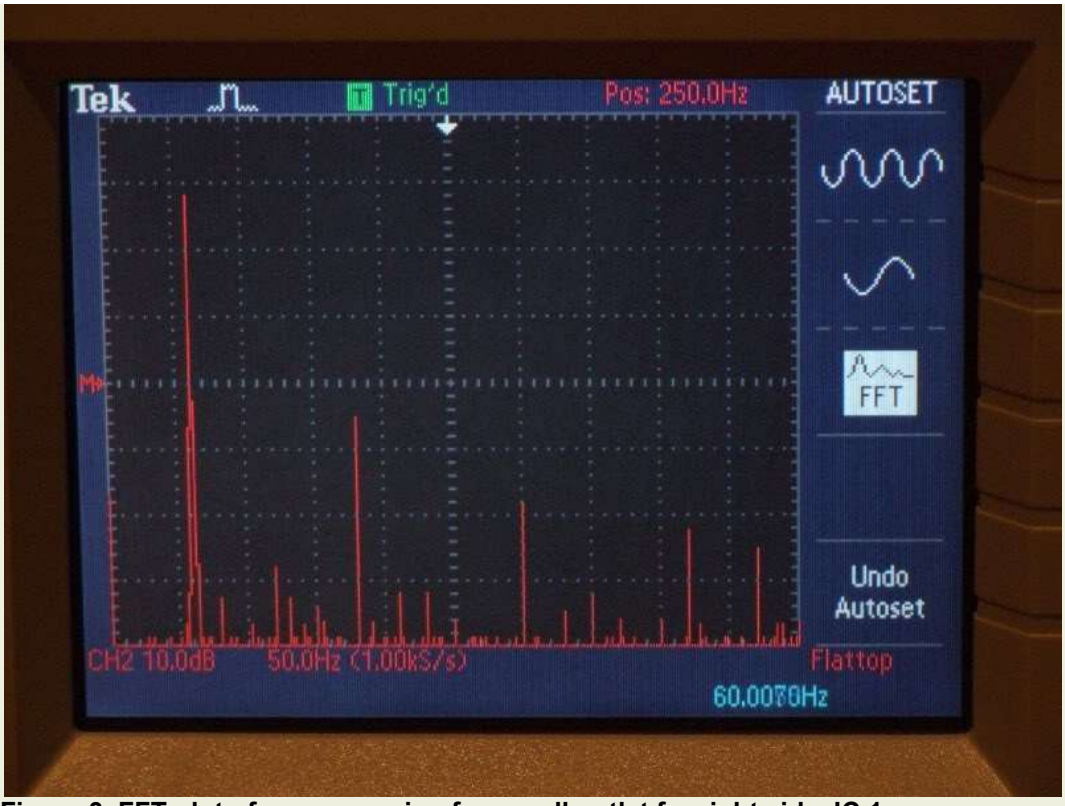

Figure 3. FFT plot of power coming from wall outlet for right side JC 1 amp.

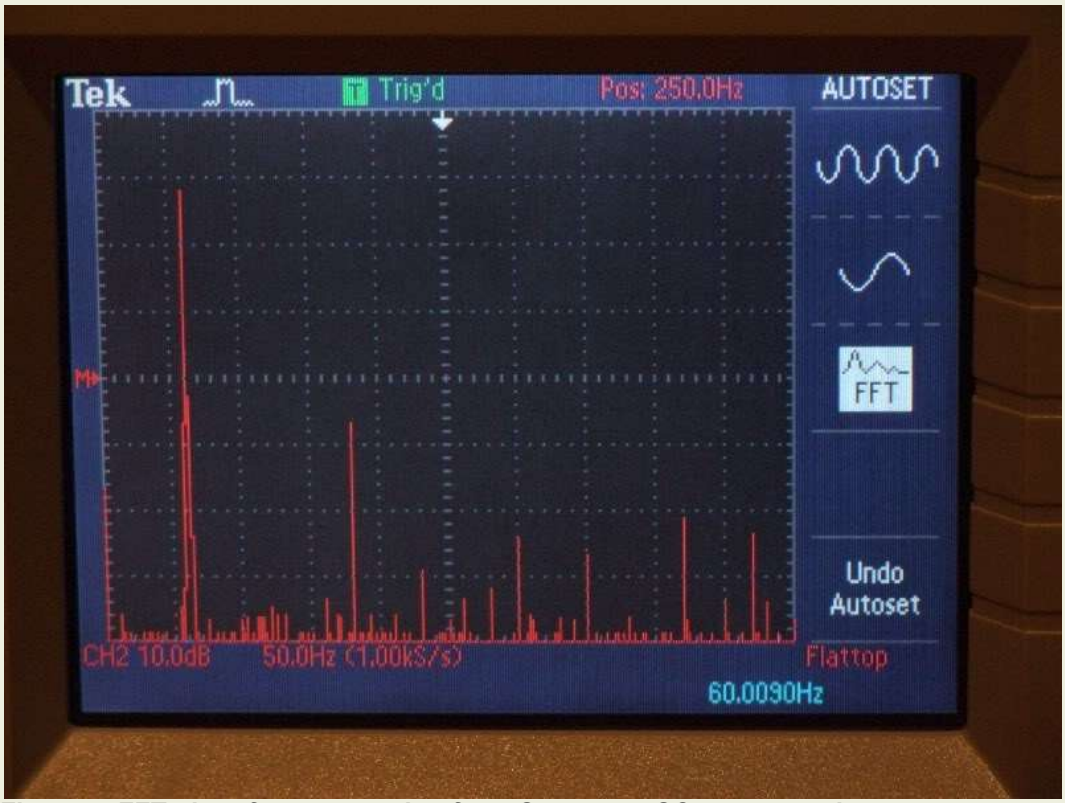

Figure 4. FFT plot of power coming from Statement SC power cord.

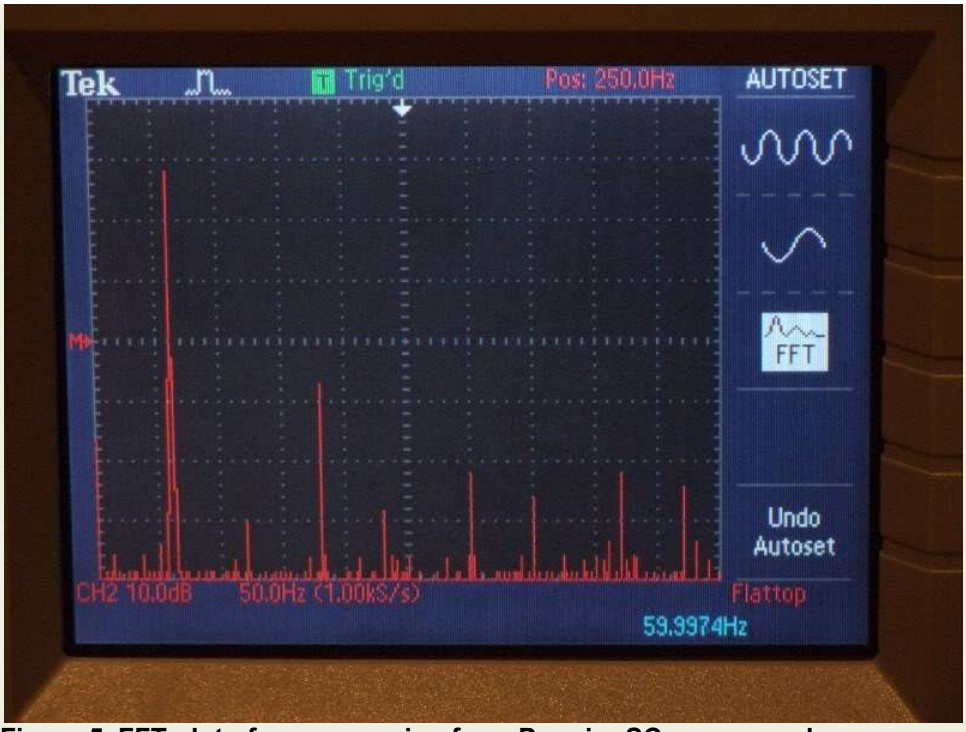

Figure 5. FFT plot of power coming from Premier SC power cord.

Both cords display a much lower and flatter noise power spectrum than the wall with a small reduction in the 3rd harmonic and significant reductions in the 5th and 7th harmonics. The Premier has a much lower and flatter noise power spectrum than the Statement.

The power spectrum (Fast Fourier Transform) plots from 0 Hz to 500 Hz for the wall socket feeding the Power Plant Premier (PPP) power regenerator, the PPP, and the Statement SC and Premier SC cords used between the PPP and the SACD player are given in figures 6 through 9.

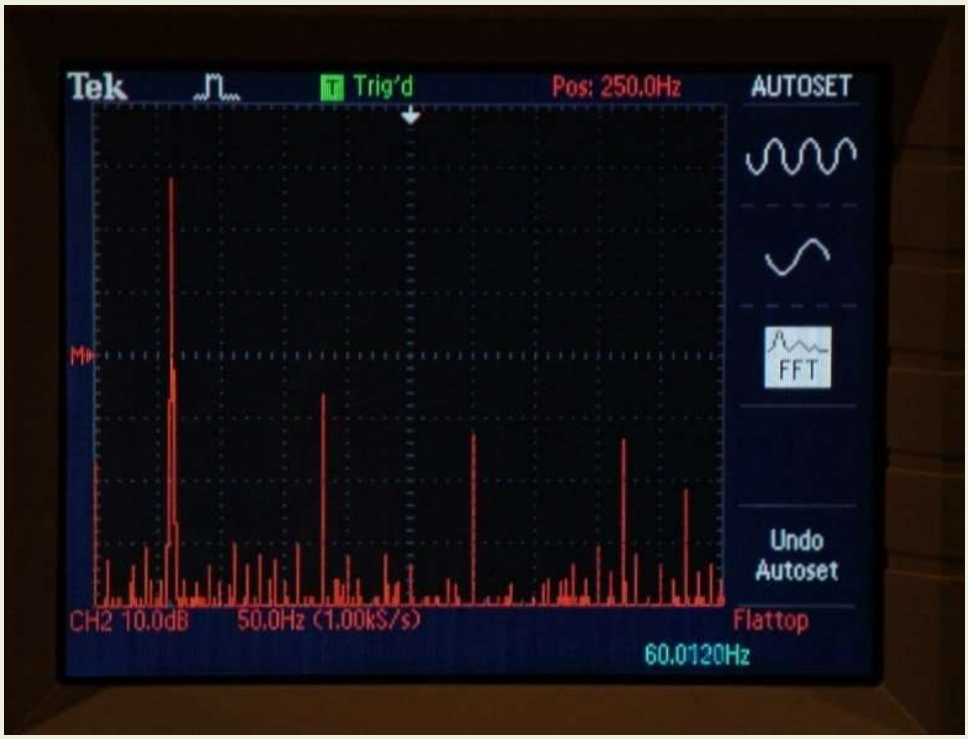

Figure 6. FFT plot of power coming from wall outlet that feeds the Power Plant Premier regenerator.

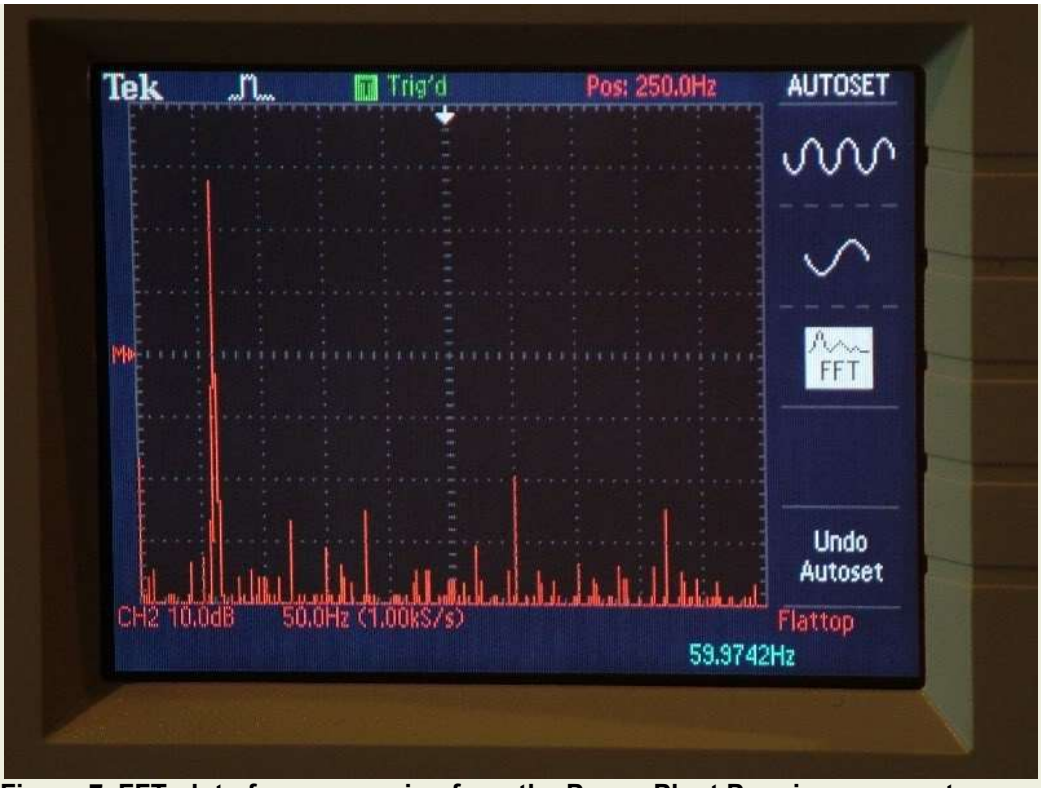

Figure 7. FFT plot of power coming from the Power Plant Premier regenerator.

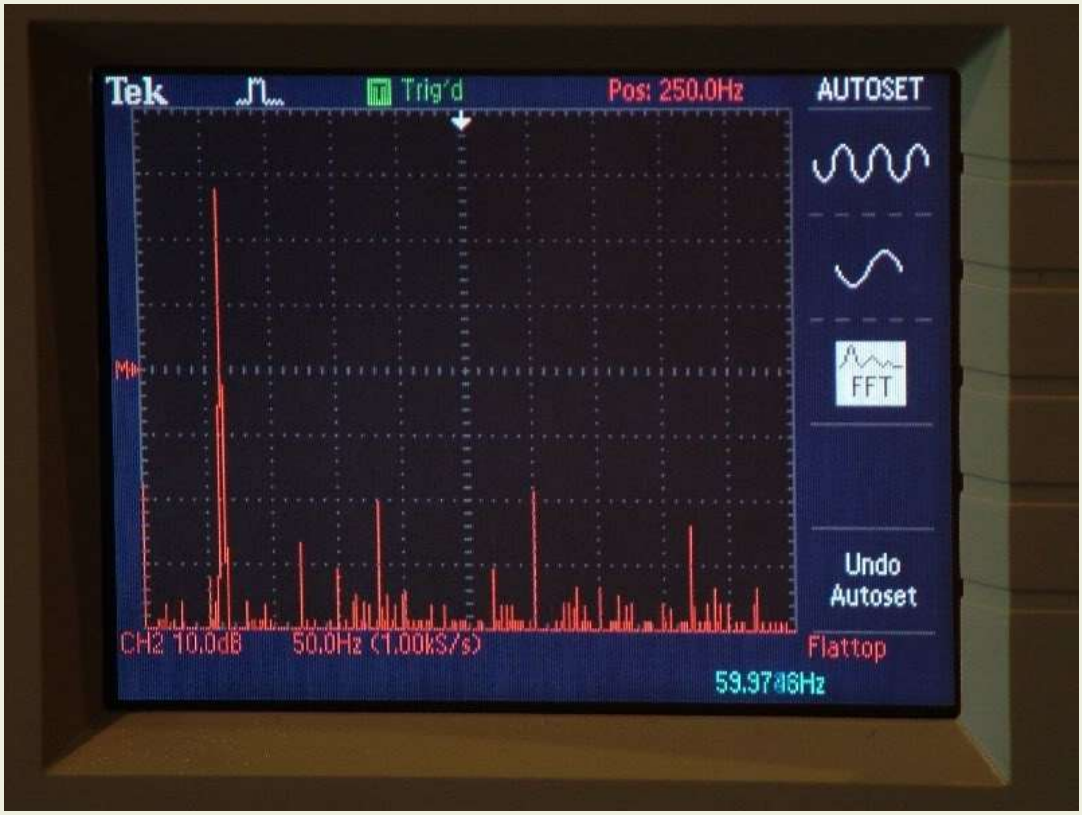

Figure 8. FFT plot of power coming from Statement SC power cord going to the SACD player.

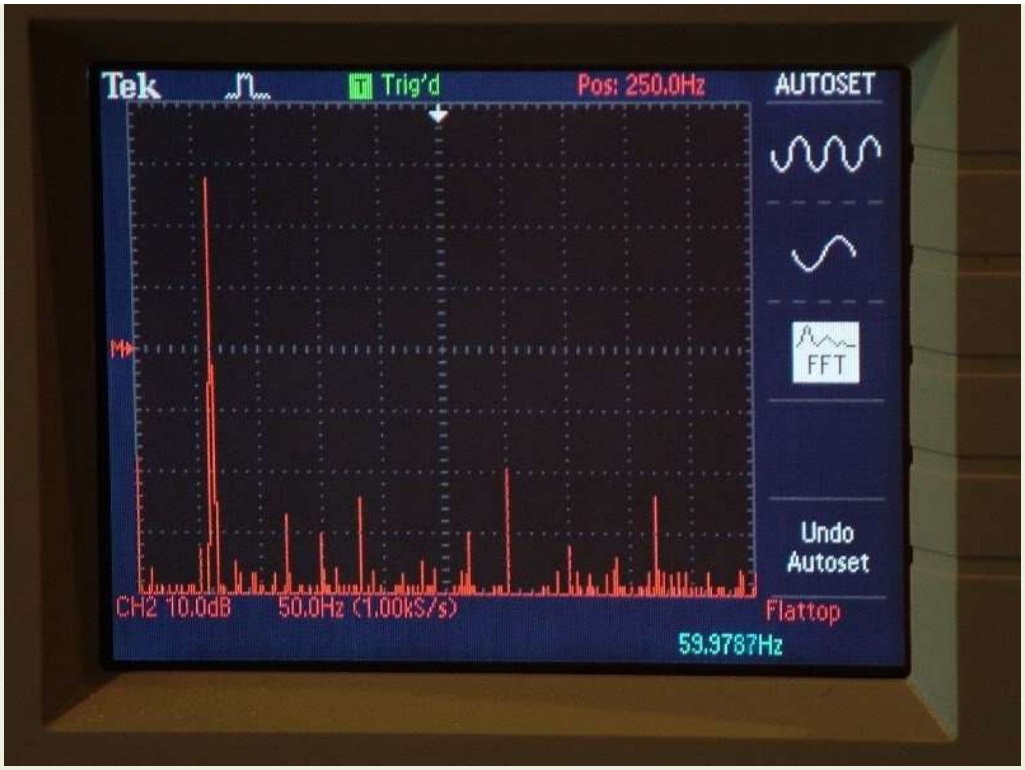

Figure 9. FFT plot of power coming from Premier SC power cord going to the SACD player. No wonder you sound so good.

A summary of the voltage measurements corresponding to the FFT plots in figures 6 through 9 is given in table 1. The noise on this power circuit would be substantially less (an average 0.7% less) if the wireless networking equipment were not on.

Table 1. Voltage Measurements From Oscilloscope

$$V = V_0 \times 10^{dB/20} \text{ , and } V_0 = 1$$

	DC 0 Hz	Fundamental 60 Hz	3rd Harmonic 180 Hz	5th Harmonic 300 Hz	7th Harmonic 420 Hz	Power Co. Control Tone 470 Hz	Sum of 3rd, 5th, and 7th Harmonics, (%)
Wall	0.65	121.6	2.24	0.97	1	0.35	4.21 (3.4%)
Power Plant Premier	0.67	121.5	0.25	0.47	0.27	0.05	0.99 (0.8%)
xStream Statement SC	0.58	121.5	0.45	0.53	0.28	0.10	1.26 (1%)
xStream Premier SC	0.65	121.5	0.28	0.47	0.29	0.05	1.04 (0.86%)

Again, the Premier SC had a much lower and flatter noise power spectrum than the Statement SC and it did a much better job of preserving the drastic noise reduction benefits of the PPP.

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Associated Equipment

Pass Laboratories X0.2 Preamplifier
Pass Laboratories Xono Phono Preamplifier
Parasound Halo JC 1 Monoblock Amplifiers
Teres Audio Model 255 Turntable
Ortofon MC Windfeld Cartridge
Graham Phantom B-44 Tonearm
Cary Audio CD 306 SACD Player
Polk Audio SDA SRS 1.2TL Speakers
Audioquest LeoPard and Sky XLR Interconnects
Audioquest Everest Speaker Cables
PS Audio Power Plant Premier Power Regenerator For Source Components

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*Pure Copper by Ono Continuous Casting Process

Part 5

1. Studies On Residential Power Line Noise - Part 5: PS Audio Power Port Premier

Introduction

I can understand the skepticism surrounding power infrastructure tweaks (power cords, audiophile outlets, power conditioners, etc.). I still struggle with forking over the cash for these types of tweaks even though I clearly hear the improvements they bring. Even more than that, I have been able to measure the performance of power infrastructure gear and gain some quantitative insight into the improvements I hear. Even though I have a fairly good theoretical grasp of what's going on, part of my mind intuitively wants to use the AC receptacles that came with my house and the power cords that came with my audio equipment and the dirty, filthy, yet very expensive, power that I get from the utility company. It can mess with your head a little bit when you try to grasp the concept that changing something in the wall...something far outside the **direct** signal path...would have even a subtle effect on sound quality. Furthermore, it just seems so unfair to cough up thousands of dollars for a nice audio system and then find out that you also need to cough up yet more $$$ to keep the utility company's power line gremlins at bay so that you can hear all (or as practically and financially close to all) of the resolution, detail, sound staging, imaging, and bass slam that you paid for. I'm not complaining. I knew going into this hobby that the audio rose garden doesn't come cheap.

My interest in a higher quality AC receptacle was piqued after the good results I achieved with the original Power Port (hereafter P2). A number of former P2 users have reported good results with the Oyaide R1 ($130, $145 cryoed). Like many P2 users, I was glad that PS Audio had finally provided a higher performance alternative. I did have some concern about the gold plating used on the copper base metal of the P3. Evidently, PS Audio had some concerns also. This quote is from the **original** Power Port overview page on the PS Audio website:

"We first considered simply gold plating the contacts of the brass, but quickly rejected that notion when several facts became apparent: gold is soft and will be quickly scraped off of the high spots of the contact area unless a gold plated male plug is inserted, and unless the surface is highly polished beforehand the problem of low surface contact area will not be addressed."

I noted that the Power Port Premier uses extensive gold plating. I assumed that PSA realized gold wasn't so bad after all, since Oyaide and Furutech seem to be using it on their higher end AC receptacles to good advantage. Live and learn. Hence, this question to PS Audio concerning the Power Port Premier's gold plating:

"I have some concern about the durability of the gold plating on the internal blade connectors. Considering the tight grip of the Power Ports on cable blades and the softness of gold, what is the maximum number of insertions/removals before the gold plating begins to deteriorate?"

Their answer:

"I have no idea, but you are right to be concerned about this, of course, as with any quality connection it is important to be sure that things are clean and free of grit to avoid undue scratching and wear, and to try and do the least amount of plugging in and unplugging. If you are planning to use a given outlet for components

that will get plugged in and un-plugged many times, the standard Power Port with nickel plating will be a better choice."

Some companies would have asked me to send my power cables to them to have the connectors gold plated, for a modest fee, of course.:) I do not do a lot of plugging/unplugging at my audio and video equipment receptacles. Plus, I am sure the smooth, highly polished nickel contacts of my Premier SC power cables will go easy on the gold plated beryllium contacts of my P3 receptacles. I also dug out my 20+ year old Yamaha C-85 preamp which has gold plated RCA jacks. They are still smooth and bright and shiny, despite my not always using cables with gold plated RCA plugs.

Figure 1. Mmmmmmm...gold...even on the carton. This is no mere box. The P3 is packaged in an elegant white carton with gold embossing. Nice packaging is an important part of the audiophile experience.;)

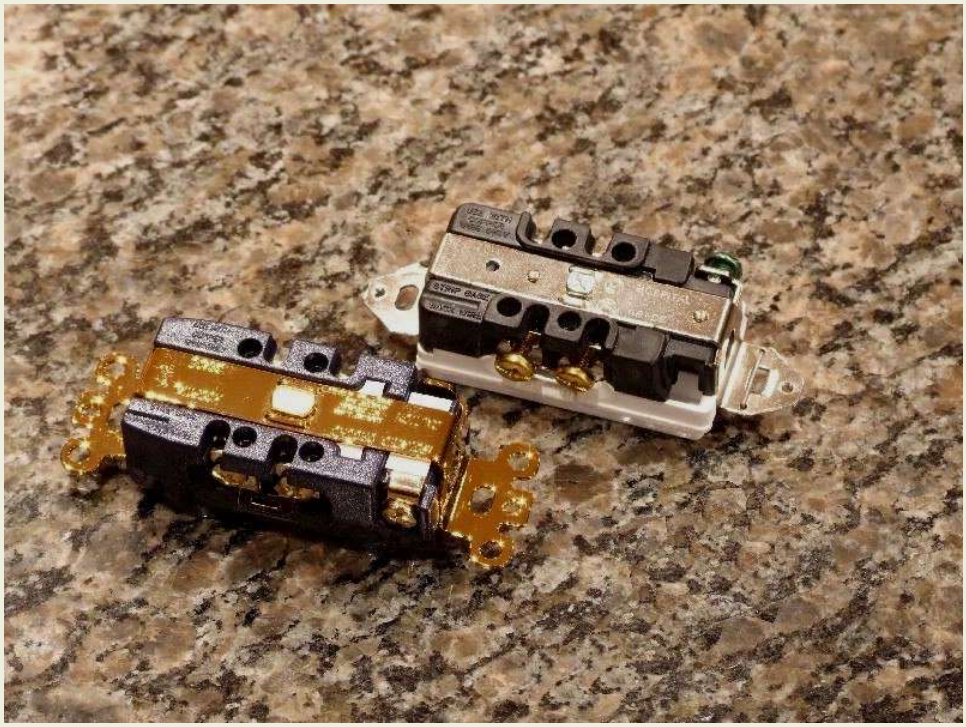


Figure 2. The P3 features a semi-crystalline polymer body and lots of bright shiny gold plating over smooth creamy rich sounding copper. The "poor cousin" P2 is just nickel plated brass in an ordinary plastic body, but it sounds worlds better than a regular residential grade outlet.

Figure 3. The two-tone effect makes it easy to identify which outlets are capable of providing Such Good Sound.

I was impressed by the tight grip of the P2. The P3 takes things up a notch to where it takes some effort to insert and remove power cable connectors. What I do is grip the connector housing with four fingers and use the thumb of that hand to push the cable out of the receptacle. If this one-hand method is not efficient for you, I would recommend bracing the wall plate with one hand and slowly removing the cable with the other. Over time, I expect that simply

grabbing the cable connector and yanking it out of the receptacle, without bracing, will weaken the retaining screw threads to the point where they will fail.

Economic Incentives

Even in the best of times, luxury items like $99 AC receptacles can be a tough sell. When times are hard, some $ incentive usually proves beneficial to manufacturer and customer. The price of the Power Port Premier is $99 for one or you can buy a 5-Pack for $399, which drops the price per receptacle from $99 to $79.80 (20% off). I just happened to need five P3's: three for the two channel system and two for the home theater.

In order to keep current P2 owners from migrating over to the likes of Oyaide and Furutech, from now until the end of December 2008, PS Audio is offering a trade in promotion allowance of $25 for a P2 that is traded in for a P3. This dropped the effective price to $54.80, which I could comfortably afford.:) It also saved me the trouble of having to sell my old P2's. Twenty five bucks is about what they sell for on the used market (new MSRP $50, average street price $35).

I was planning to order a pair of Oyaide R1's for evaluation but Paul McGowan took a cue from Marlon Brando and made an offer I couldn't refuse. Let's see...$54.80 for the P3 copper/gold/beryllium/PBT receptacle or $145 for the R1 copper/gold/beryllium/PBT receptacle?

Figure 4. The home theater system received its fair share of P3's.

The Sound: First Day Impressions

Some P2 users complained of initial harsh, bright, brittle sound. Some users said the harshness diminished over time but never went away, even after the recommended 300 hour break in. I never experienced such unpleasant sound with the P2. Sometimes, for a variety of reasons, a particular accessory just doesn't play well with what you have. It is not necessarily a bad reflection on either the accessory or the system it was used in. The results from these kinds of tweaks are highly system dependent.

My Parasound Halo JC 1 monoblock amplifiers are each fed by a dedicated 20 amp circuit. The source components

are on another dedicated 20 amp circuit and are fed regenerated AC from a PS Audio Power Plant Premier. Prior to this evaluation, the amplifier AC circuits and the third dedicated circuit for the source components were terminated by P2 receptacles.

The right channel P2 was replaced with a P3 and monophonic program material was compared between the left and right channels. The right side was apparently a little louder, indicating a lower noise floor, and the bass was more tactile and defined. Bass instruments had a heavier and more articulate "growl" component. The midrange and treble was also a little clearer.

The P2's of the two other AC circuits were replaced and evaluation was done in stereo mode. In addition to the improvements noted above, now the midrange and treble was noticeably heavier and there was an enhanced sense of depth between images in the sound stage. The sound stage width and height did not change, but images at the far sides of the stage were apparently louder.

PS Audio recommends a break in period of 300 hours. I'll follow up after that milestone has been passed. This was an auspicious beginning, therefore I expect more good sound after break in.

1. This Section Is Only For The Meter Pontiffs

Noise Analysis

I took noise spectrum measurements of the right amplifier's AC circuit terminated with a regular contractor grade receptacle, a Power Port receptacle, and a Power Port Premier receptacle. The Fast Fourier Transform plots showing the power spectrum in each case are given in figures 5-7. If you save figures 5-7 and then click through them in succession, you will see that the fundamental and harmonic structure of the power basically remains the same, but the "dirt" down around the noise floor gets lower in magnitude and density.

Figure 5. Good: Dedicated audio circuit with regular household AC receptacle.

Figure 6. Better: Dedicated audio circuit with P2 AC receptacle.

Figure 7. More better: Dedicated audio circuit with P3 AC receptacle.

Figures 8 and 9 show the result of a 61 Hz test signal measured at the SDA inputs of the left and right speakers. The amplitude and density of the noise on the right side, with AC power fed through a P3 receptacle, is significantly lower than that of the left with the P2 receptacle.

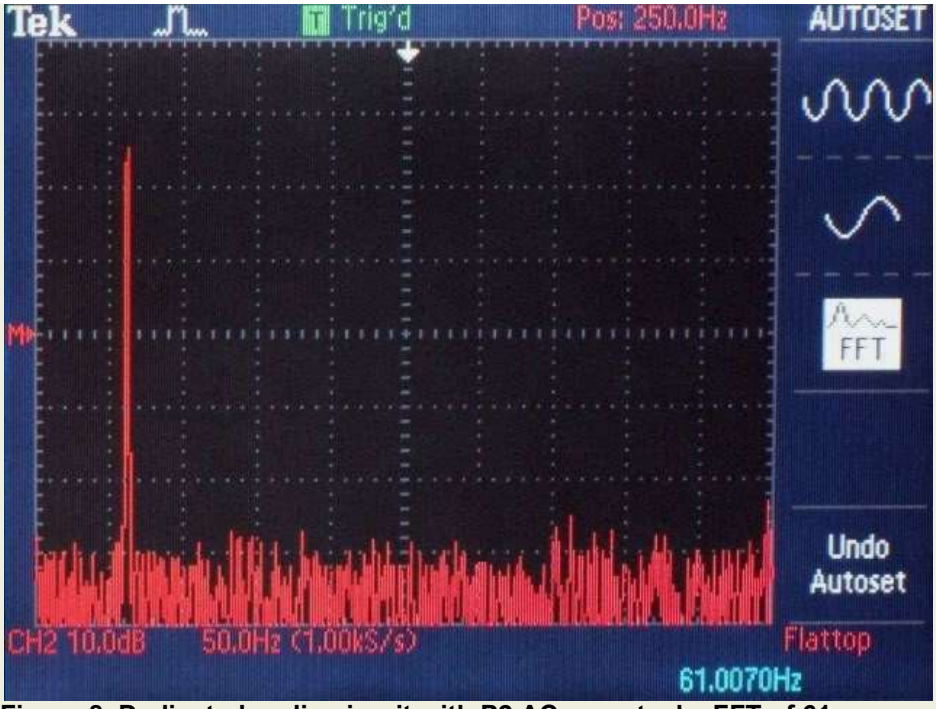


Figure 8. Dedicated audio circuit with P2 AC receptacle. FFT of 61 Hz test tone taken at left speaker SDA input.

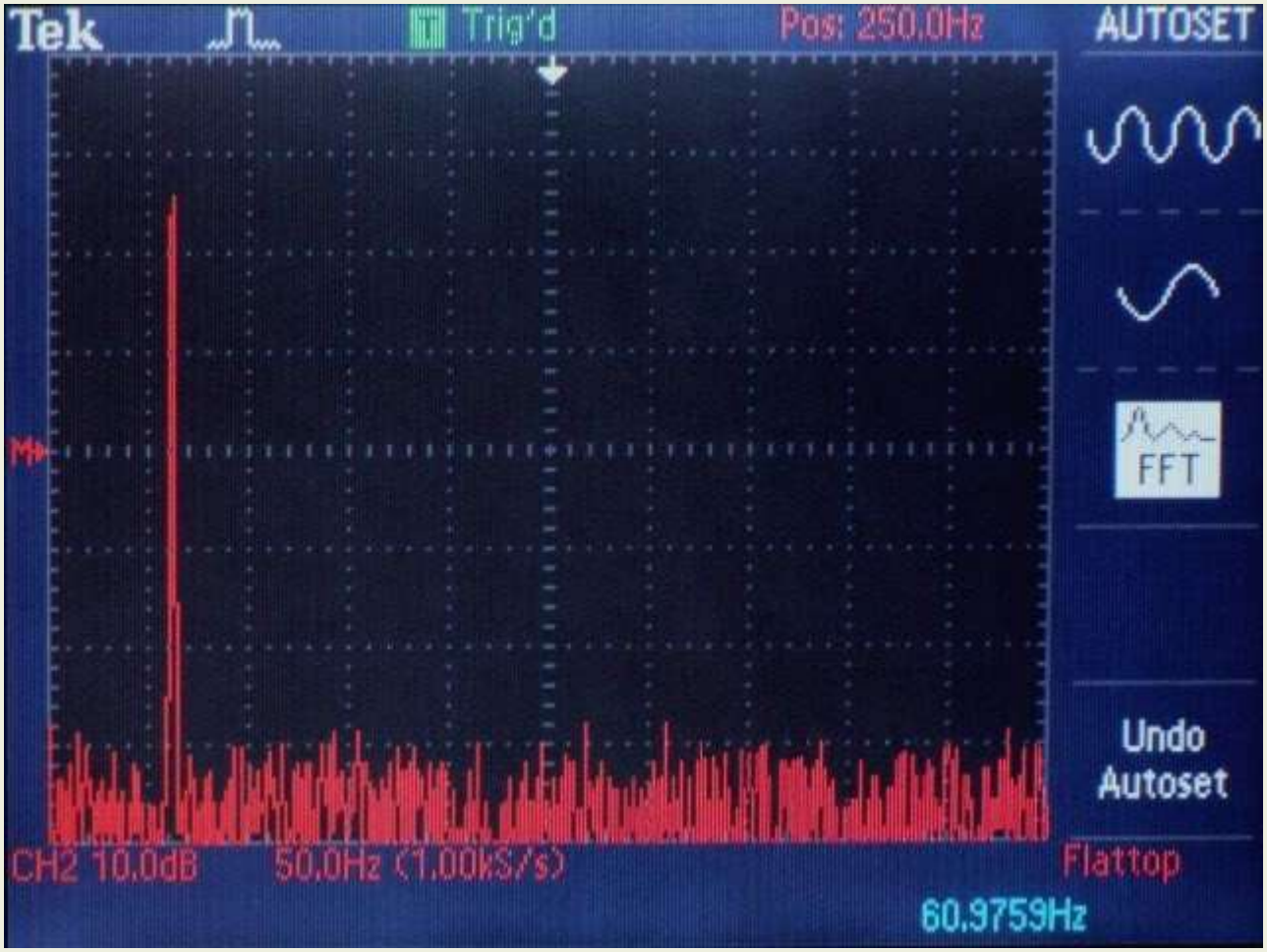


Figure 9. Dedicated audio circuit with P3 AC receptacle. FFT of 61 Hz test tone taken at right speaker SDA input.

Of course, simple noise spectrum measurements cannot completely quantify the sonic improvements brought by the P3. Since the power signal is interacting with the P3 at the molecular and atomic level, we would need to take measurements at that level to fully understand what is going on.

Conclusion

PS Audio brought the first audio grade AC receptacle to market in 2002. The original Power Port was manufactured for PS Audio by Hubbell and was a customized version of a Hubbell hospital grade receptacle. Prior to that, audiophiles were replacing standard residential receptacles with hospital grade outlets. Once it became evident that there was $$$$ to be made in this accessory niche, Oyaide, Furutech and others joined the party. The highly regarded Oyaide R1, which was introduced in 2007, has come to be regarded by some as the finest AC receptacle available. It costs $130 for the regular version and $145 for the cryogenically treated version. An aftermarket cryogenically treated version of the Power Port Premier is available from Cryo Parts (www.cryo-parts.com) for $110. Cryo Parts also offers a cryoed version of the original Power Port at no extra cost over the $50 retail price. A PS Audio representative said that they have not had a chance to listen to any of the cryo treated Power Port Premiers, but that they do trust Cryo Parts expertise.

The Power Port Premier bears some similarities to the Oyaide R1. Both use PBT (Polybutylene Terephthalate) for the body material, although PS Audio uses a proprietary PBT composition. Both use beryllium copper contacts and extensive gold plated copper parts. One wonders why PS Audio was so late coming to market with an improved AC receptacle, even though the faithful were clamoring for one for years. Perhaps they didn't think sufficient market demand was there. Perhaps they were busy with other things. Their engineering staff has been coming out with a lot of nice new stuff since 2002.

I'm sure the similarities between the Power Port Premier and the Oyaide R1 are too enticing for the professional audio reviewers to ignore for long. A shootout is likely forthcoming...if it hasn't already been done and is simply awaiting publication. Since PS Audio's marketing literature for the P3 says that "The Power Port Premier is the ultimate AC receptacle on the market today", I'm sure they have compared the P3 to the top contenders out there and have the performance fire to go with the marketing smoke.;) The P3's physical and sonic superiority over the P2 was immediately obvious to me. There weren't any diminishing returns either. The P3 costs twice as much as the P2, but it is easily 2X (or more) better when all the improvements in detail, articulation, clarity, imaging, sound staging, noise reduction, and gripping power are considered.

If the P3's perform the same or better than the R1's, cost 1/3 less, and come in much more distinguished looking packaging, then PS Audio has an excellent chance of climbing back to the top of the audiophile AC receptacle market.

Addendum

I was pleasantly surprised to see that my power quality had significantly improved, although it is still not back to pre-hurricane Gustav quality. A month ago, and as little as two weeks ago, my AC power had much higher levels of 5th and 7th harmonic distortion and other noise. This contributed to noticeably flattened power waveform peaks. The 5th harmonic was, and still is, higher in amplitude than the 3rd harmonic. After Gustav, the 7th harmonic was close in amplitude to the 3rd and 5th, but lower than either of them. Ideal is for the odd order harmonics to diminish in amplitude as as you go up in frequency. Even order harmonics are usually not a concern in North American public utility systems. Voltage levels have stabilized to pre-Gustav variances. After Gustav, the voltage level would also vary -1/+4 within a single hour rather than the pre-Gustav variation of -1/+4 within a 24 hour period.

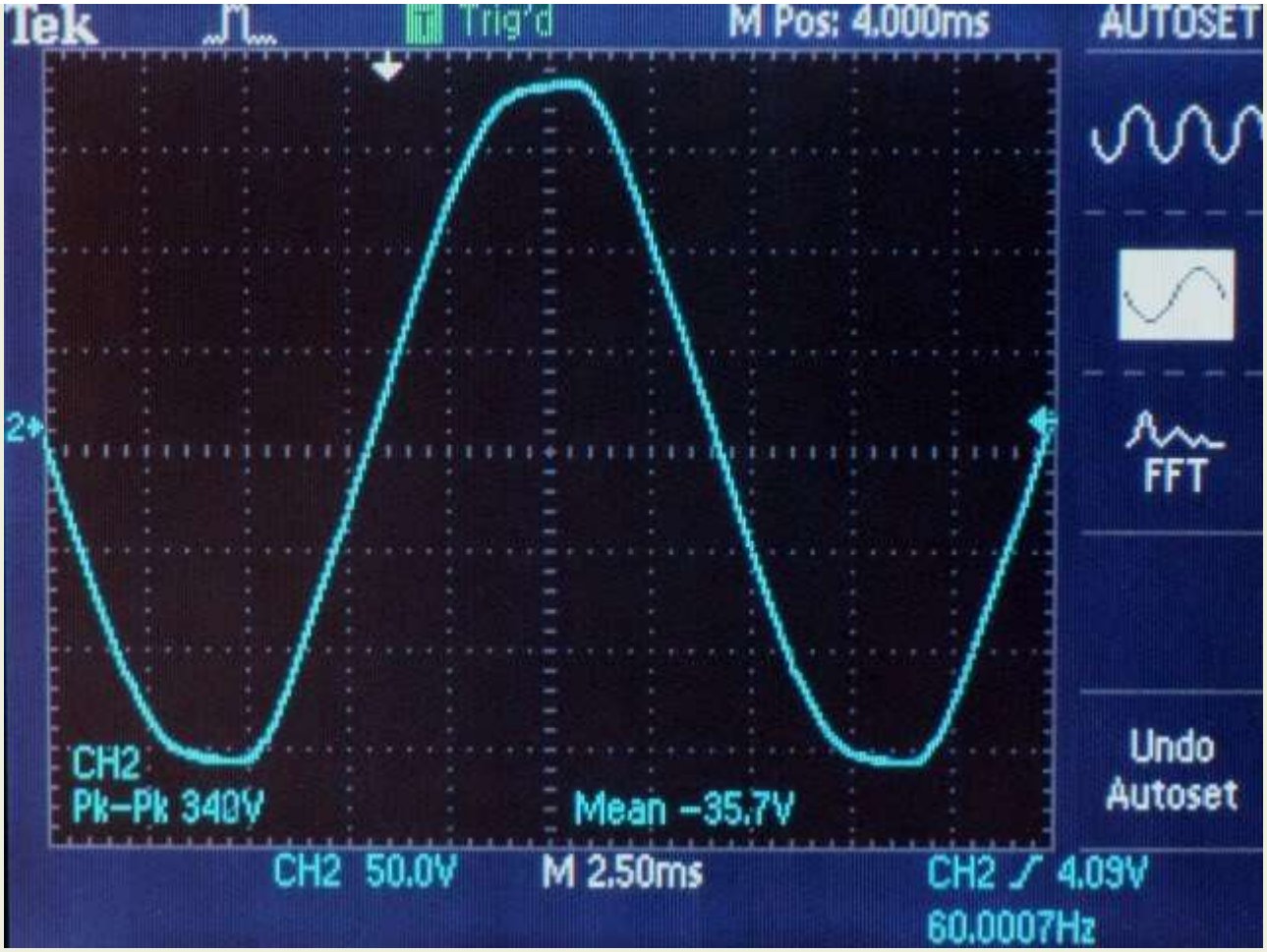


Figure 10. AC power waveform with ordinary residential grade outlet measured on 10-28-08.

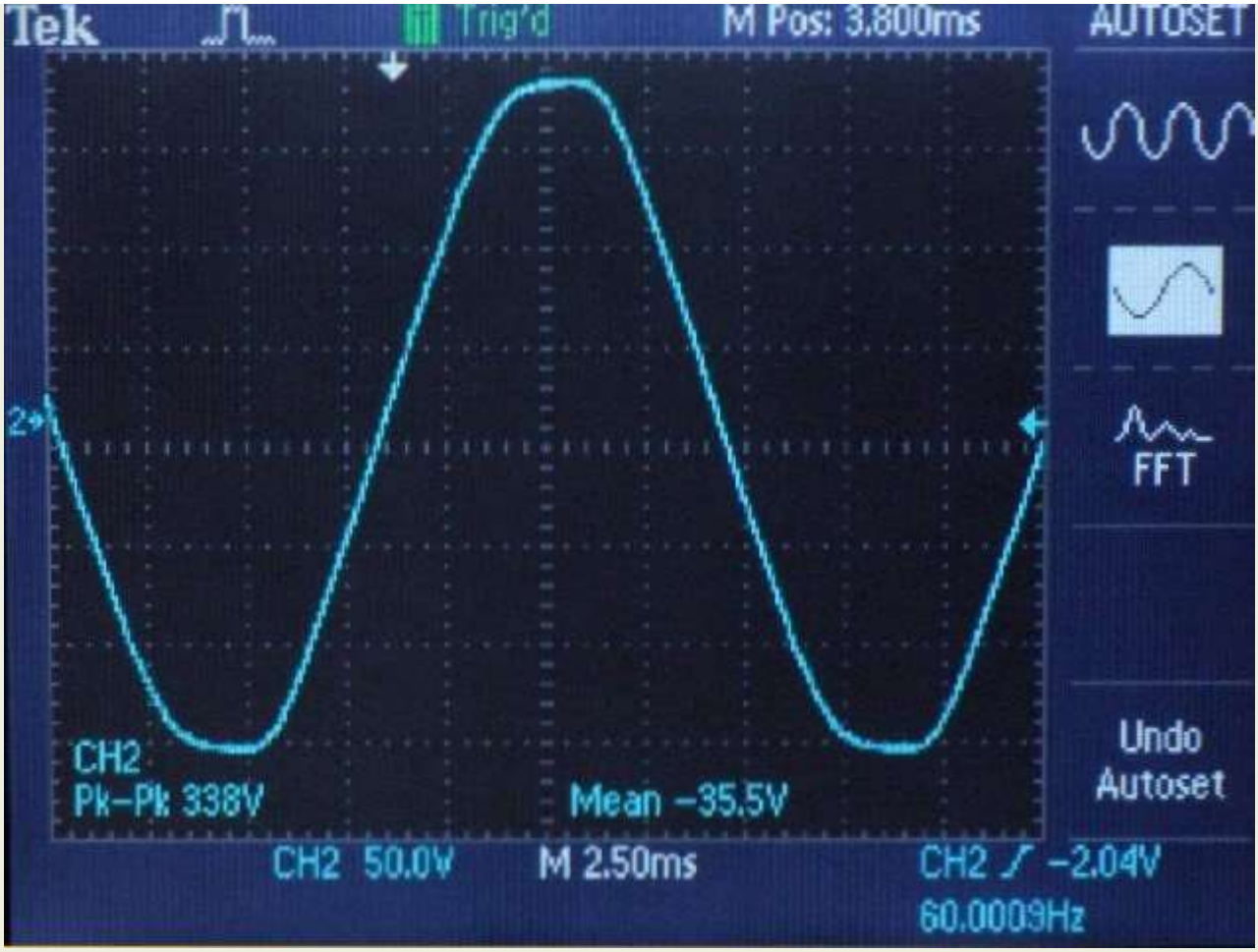


Figure 11. AC power waveform with ordinary residential grade outlet measured on 11-14-08.

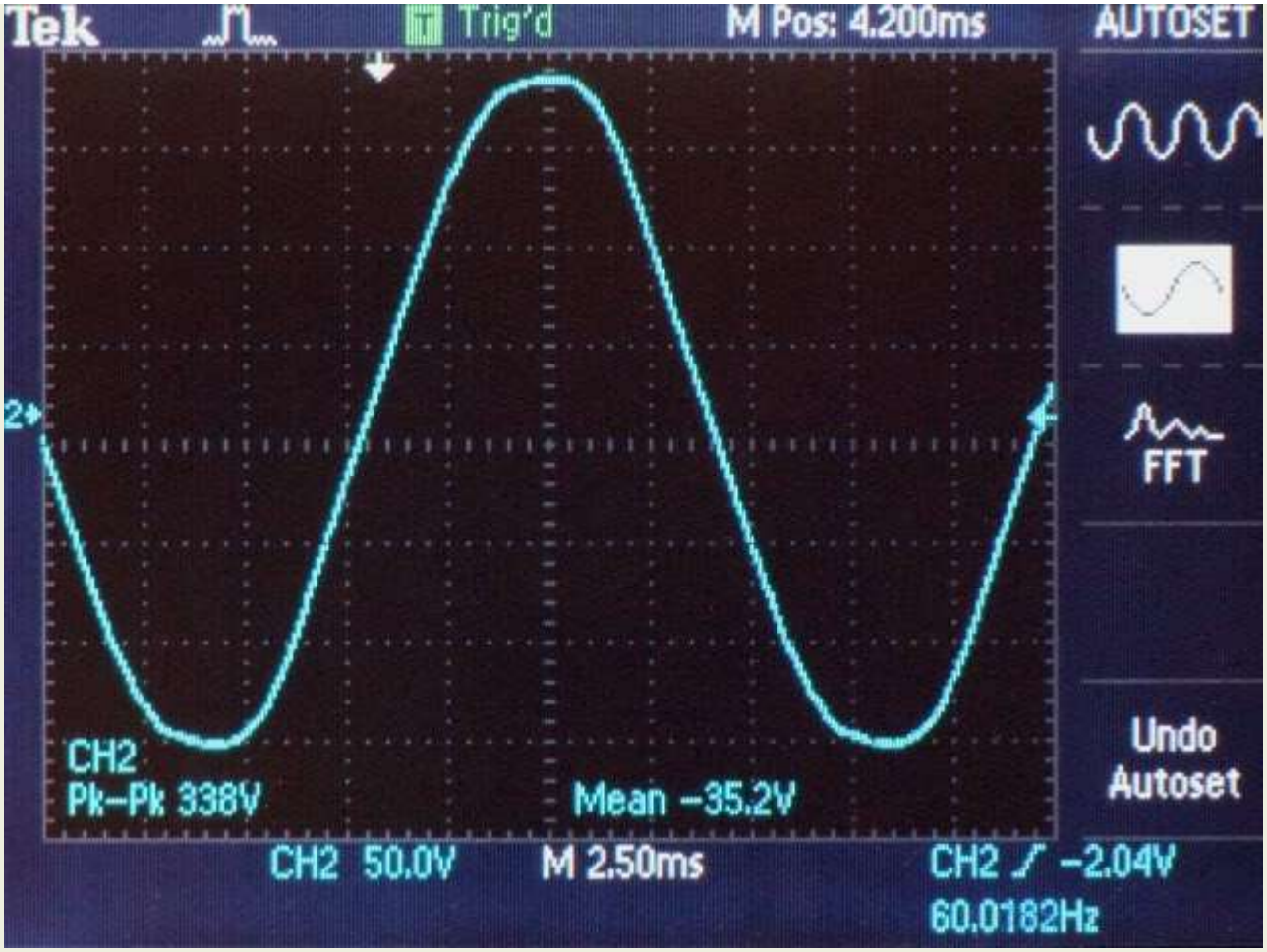


Figure 12. AC power waveform with ordinary residential grade outlet measured on 11-28-08.

Part 6

1. Studies On Residential Power Line Noise - Part 6: PS Audio Soloist Special Edition

Introduction

The PS Audio (PSA) limited edition Soloist Premier SE is a "wall mounted surge protection and resolution enhancement device" that incorporates passive noise filtering and the Power Port Premier (P3) audio grade AC receptacle. The Soloist Premier improves upon the standard Soloist with the addition of an upgraded AC receptacle, higher grade capacitors and other tweaks that PSA does not wish to divulge. PSA is offering the Soloist Premier at $250 (while supplies last).

The February PS Audio A/V Journal states that, due to much better than anticipated demand, they have decided to make the Soloist Premier part of their regular product line. No price was given for the regular production Soloist Premiers, the journal only stated that "for now, we'll keep the price low and see how it goes".

Figure 1. The Soloist comes in nice "gift box" type packaging. Thoughtful touches like this enhance the audiophile experience. If PSA decides to put the Soloist SE into full production, they should consider a new box with a little gold trim...like the Power Port Premier box. The "CI" stands for "Custom Installation".

Owners of the regular Soloist have reported very good results after retrofitting them with the P3. So much so that PSA decided to look into it as a potential product offering. Rick Cullen (www.cullencircuits.com) offers a PSA approved upgrade of the regular Soloist to Soloist Premier standards for $130.

From the PS Audio website:

"This is not just the Soloist, but a limited edition Soloist built around the Power Port Premier AC receptacle. Each of these are hand built, some by Paul himself, and hand tweaked for best performance. We are limiting this run to 200 pieces because of the extremely low price and when they're gone, that's it. The special edition Soloist Premier is only $50 higher than a standard Soloist but with the addition of a $100 Power Port Premier, hand installed and tweaked. The Soloist is the only in-wall full featured power conditioner made."

Evaluation Procedure

Power is supplied to my two channel system by three dedicated 20 amp AC circuits. One circuit powers a PS Audio Power Plant Premier AC regenerator which then powers the line level and phono preamplifiers and source components. The other two circuits power the Parasound Halo JC 1 monoblock power amplifiers. Prior to the Soloist evaluation, all AC circuits were terminated with PS Audio Power Port Premier AC receptacles.

Listening evaluations were conducted with two Soloist Premiers as follows:

1. Soloist on right power amp circuit compared to Power Port Premier on left power amp circuit.

2. Soloist in Power Plant Premier circuit and both power amps fed through Power Port Premiers.

3. Soloist in each power amp circuit.

The Soloists were not installed in the wall during the first 75 hours of evaluation. They were laid on boxes of sufficient height and connected to the wall wiring.

Measurements were taken during a weekday afternoon with a Tektronix 2012 TDS oscilloscope.

Figure 2. Limited edition run of 200 units. Some hand built by PSA CEO Paul McGowan. I might send mine back to get signed.

Figure 3. The Soloist Premier faceplate is 3/8" thick milled aluminum.

Figure 4. Soloist Premier SE inside.

I was interested in switching the Soloist's Power Port Premier receptacles with the broken in Power Port Premiers I already had. I changed my mind when I saw the inordinate amount of desoldering and soldering that would have been required. Fortunately, the Soloist didn't take long to break in.

Measurements

Bear in mind that these are simple and relatively crude measurements taken outside of a laboratory environment. Nevertheless, they provide some quantitative insight into the Soloist's performance. I will leave the more rigorous laboratory testing to the interested meter pontiff.

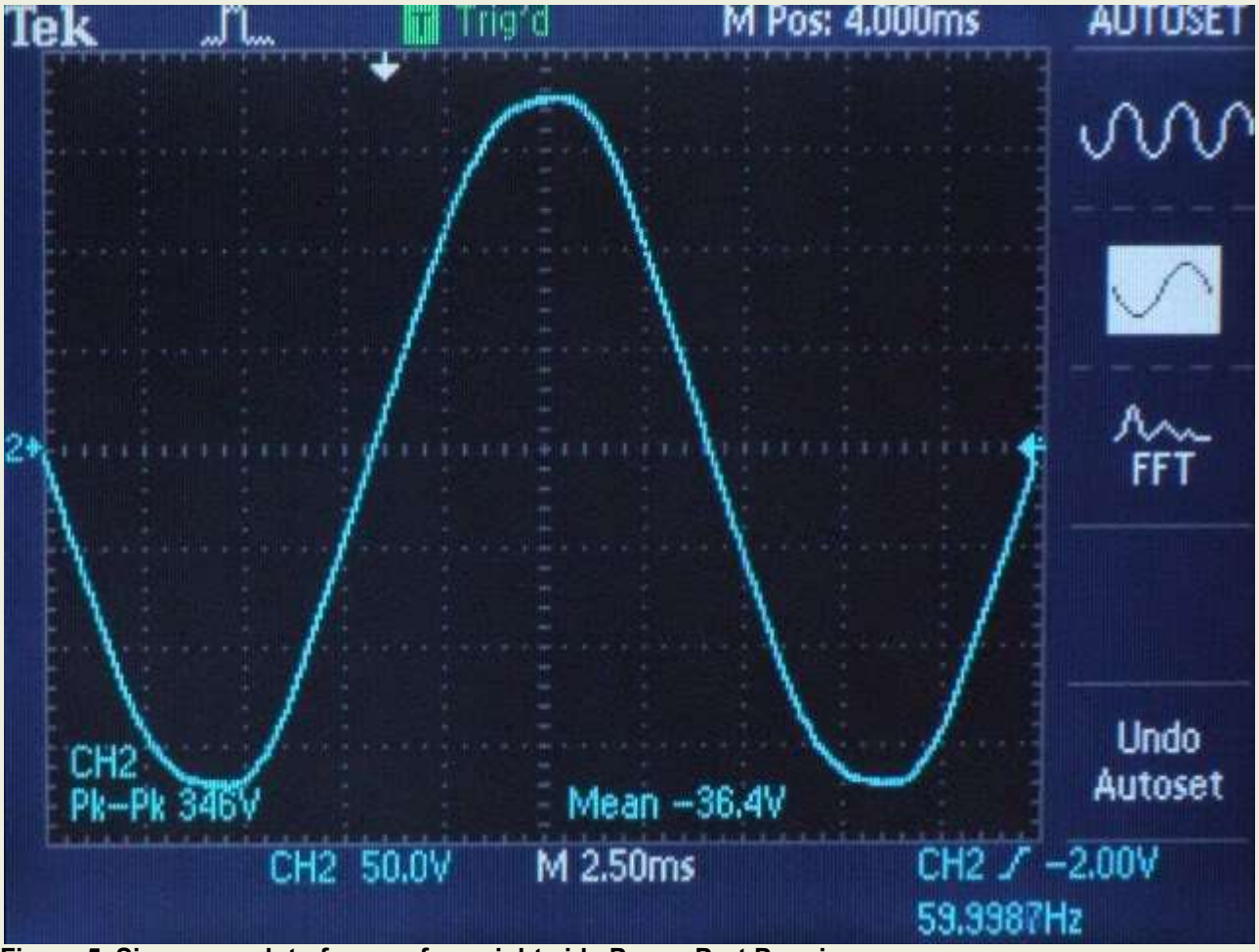


Figure 5. Sine wave plot of power from right side Power Port Premier.

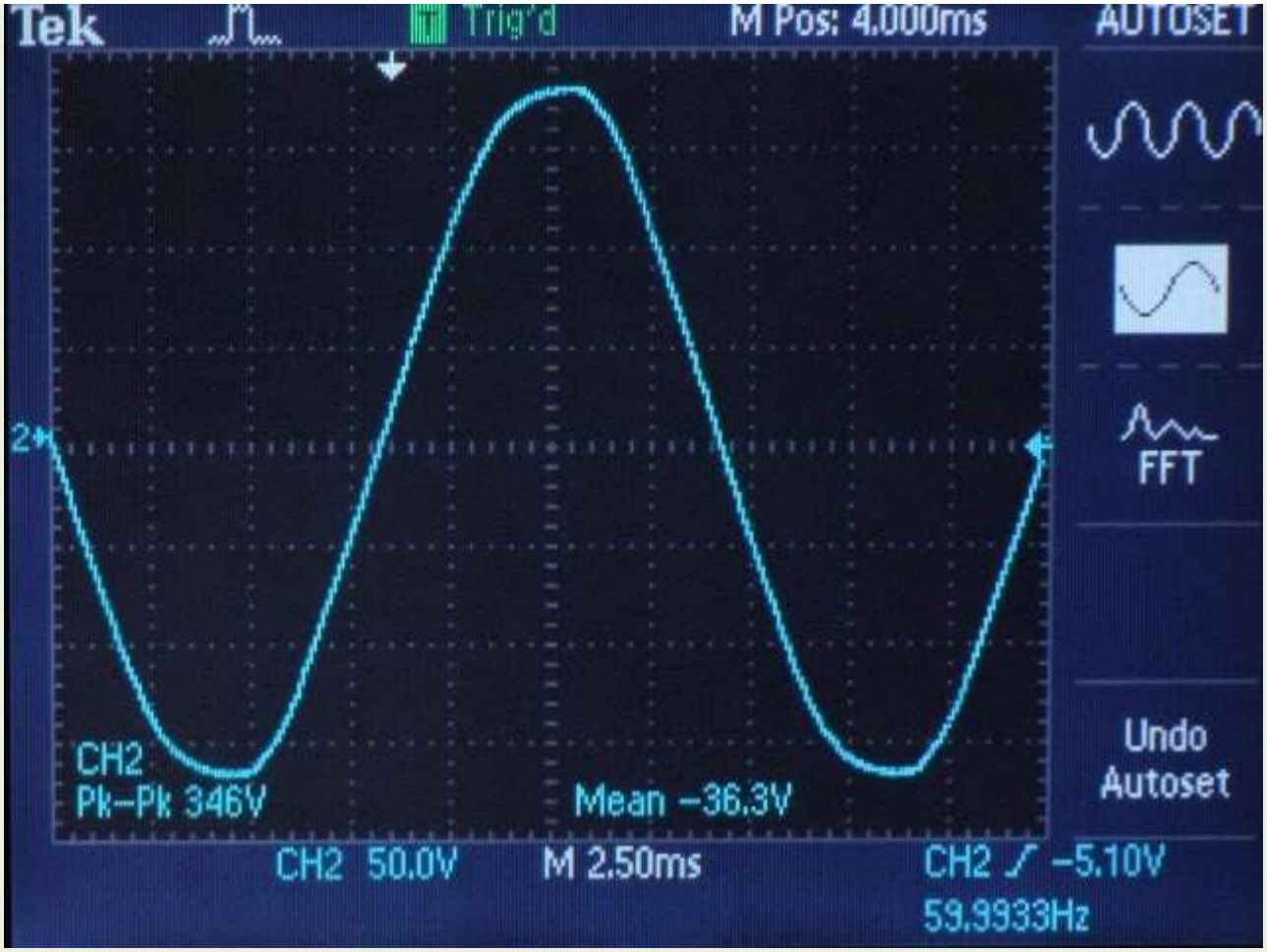


Figure 6. Sine wave plot of power from right side Soloist Premier SE.

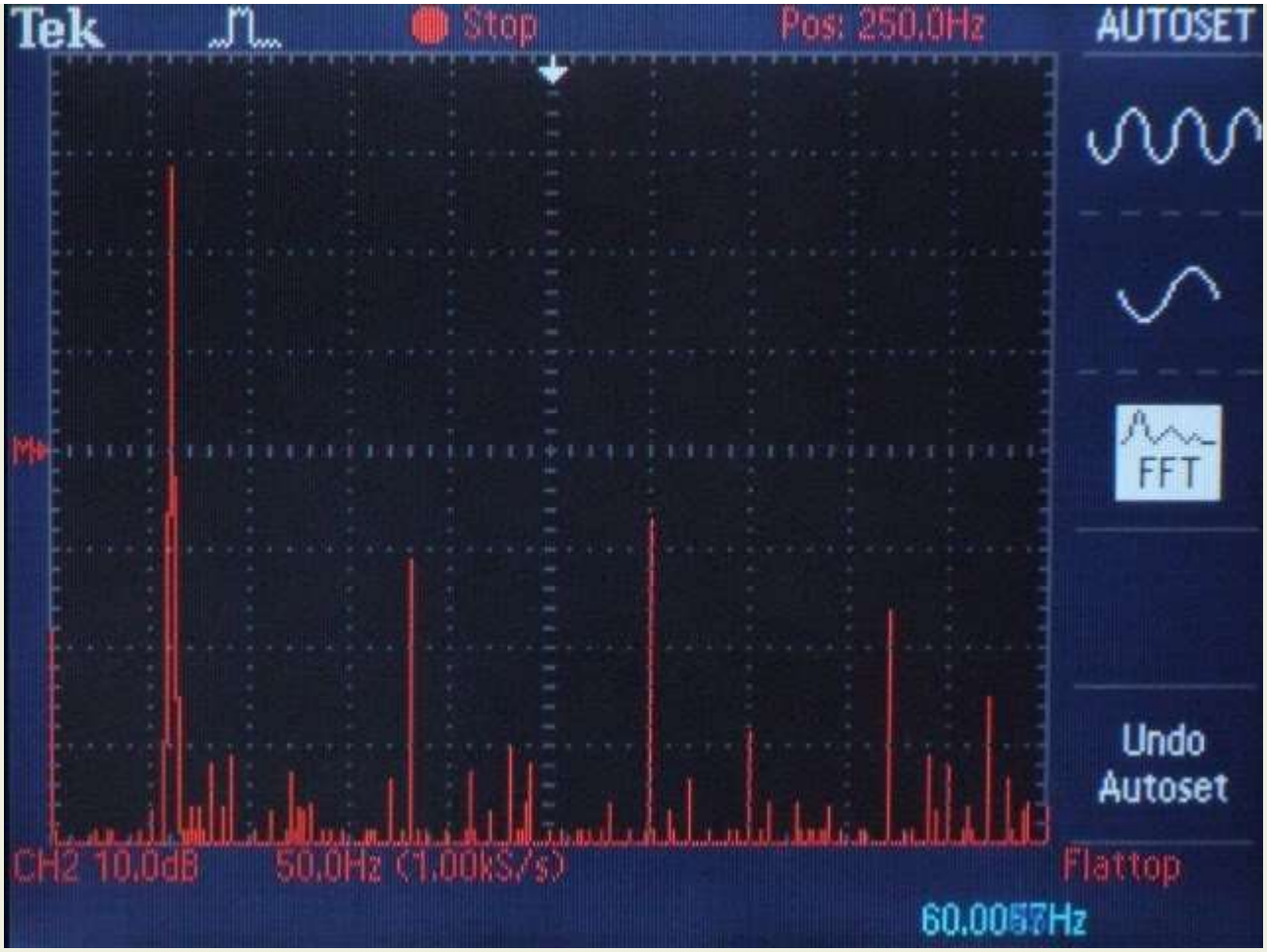


Figure 7. FFT plot of power from right side Power Port Premier.

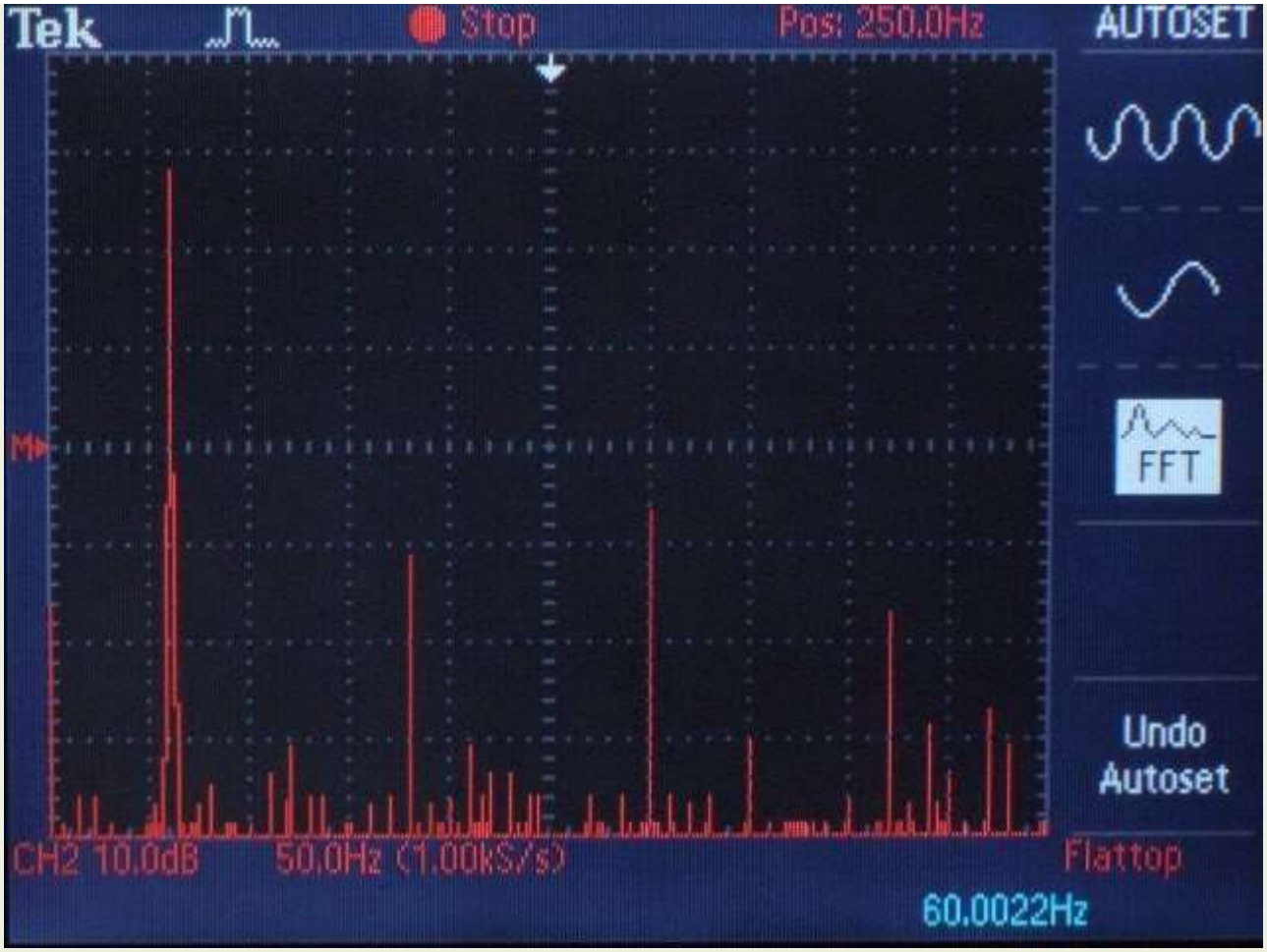


Figure 8. FFT plot of power from right side Soloist Premier.

The differences between the sine wave and Fast Fourier Transform plots of the Soloist SE and the Power Port Premier are somewhat obscure unless you are able to flip back and forth between them using graphics software. The FFT plot of the Soloist (figure 8) shows an overall flatter and lower amplitude noise spectrum. The sine wave plot of the power through the Soloist (figure 6) displays less flattening in the peaks due to more noise being filtered out. While the difference in normal mode noise near 60 Hz was slight, the differences in common mode noise was significant.

From the PS Audio website:

"The Soloist's power coupler reduces common and differential mode noise by up to 40 dB, meaning that whatever noise is on the line will be reduced by over 100 times."

Common mode noise reduction is important because electronic equipment is 10 to 100 times more sensitive to common mode noise than normal mode noise (noise between line (hot) and neutral). I do not have the proper test apparatus at home to measure differential mode noise. The common mode noise (noise between neutral and ground) is easily measured with an oscilloscope. Figures 9 and 10 show the differences in common mode noise between a regular residential grade outlet and the Soloist SE on one of the amplifier's AC circuits.

Figure 9. FFT plot of common mode noise from regular receptacle.

Figure 10. FFT plot of common mode noise from Soloist Premier.

The common mode noise from the Soloist Premier was immeasurable as it was identical to the background noise in the oscilloscope. PS Audio arrived at their 40 dB common mode noise reduction figure by injecting a noise signal on the AC line and measuring its attenuation by the Soloist.

I assume that the filtering of common and differential mode noise is the reason why the Soloist Premier makes **Such Good Sound**.

Soloist Effect On Power Plant Premier

The noise content of the PPP's output power was diminished by being fed through a Soloist rather than a Power Port Premier. However, I did not hear a difference or improvement in the sound. The differences between figures 11 and 12 are difficult to discern when comparing them side by side. When I switched between the two plots with my graphics software, the Soloist's lower noise output was easily seen. This AC circuit also has my wireless networking equipment on it.

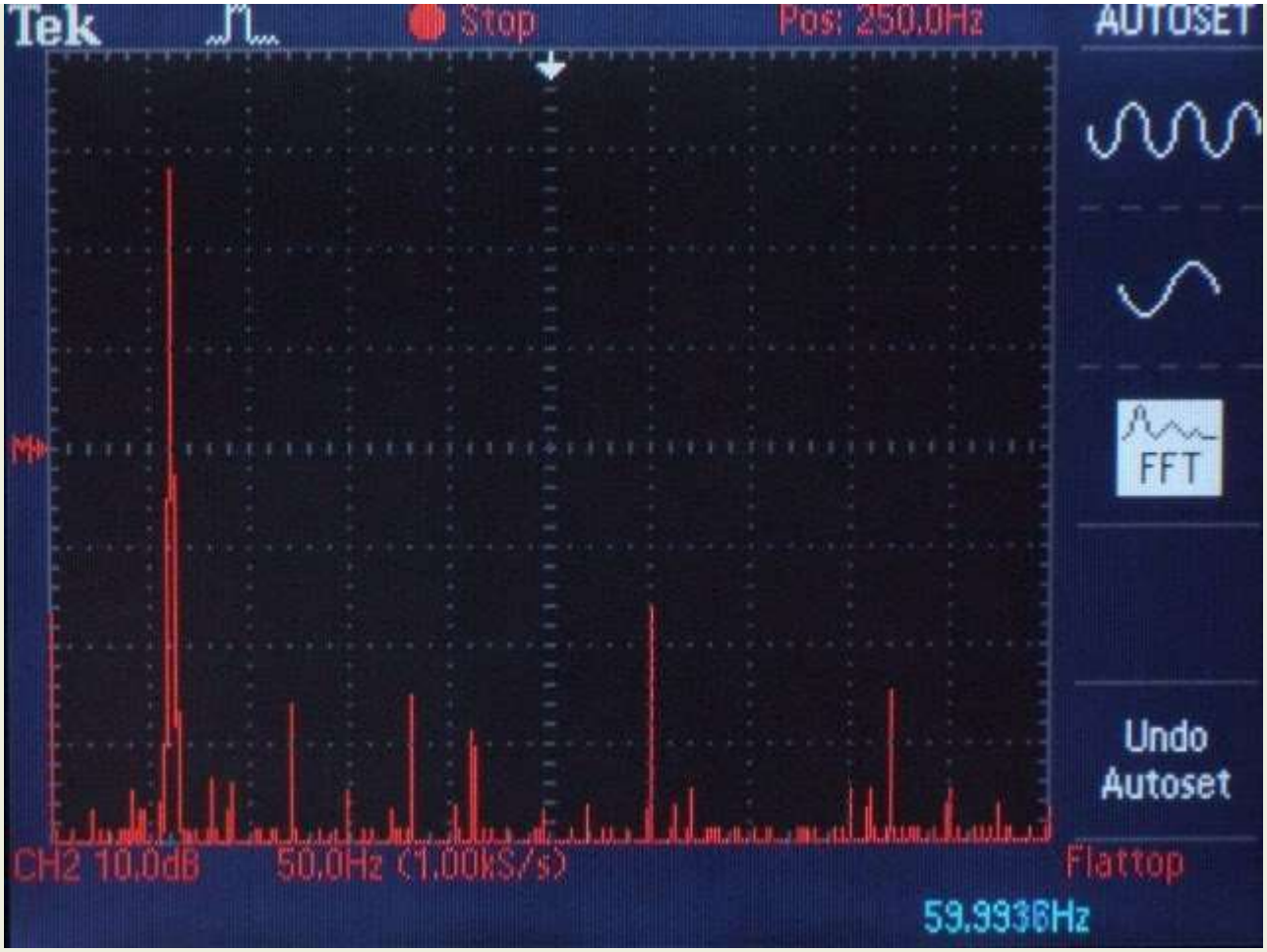


Figure 11. FFT plot of power from Power Plant Premier feed by Power Port Premier.

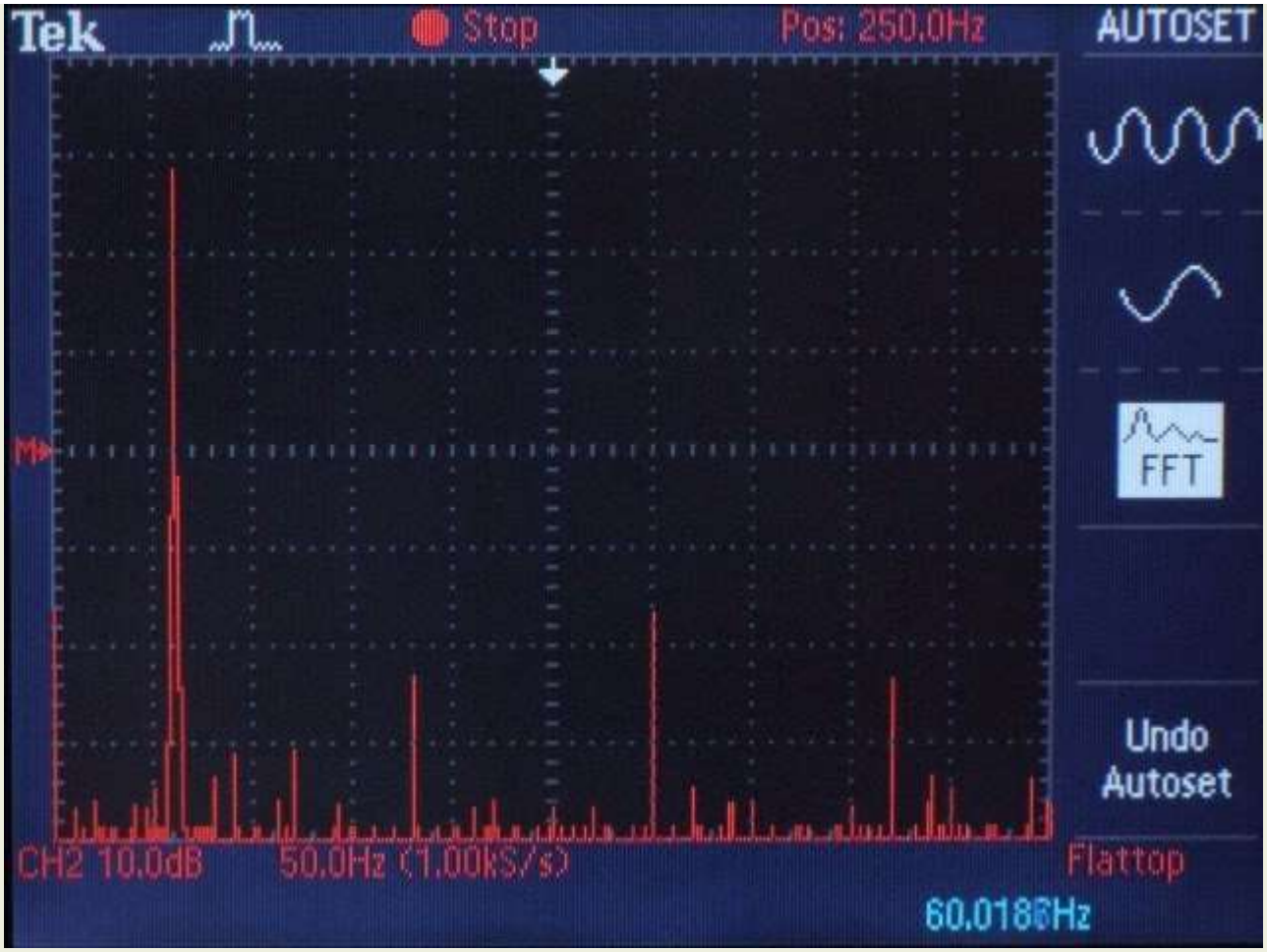


Figure 12. FFT plot of power from Power Plant Premier feed by Soloist Premier SE.

1. Studies On Residential Power Line Noise - Part 6: Continued

Performance And Installation Concerns

I had some concern about current limiting and constriction of dynamics due to the Soloist Premier SE's passive filtering. PS Audio says there is no current limiting with the Soloist. I was abjured by Parasound not to put any active or passive circuitry between the JC 1's and the wall because there would be trouble. Not major trouble, but trouble enough with sound staging, imaging, details, and dynamics. I did experience such trouble when I tried to run a single JC 1 from a Power Plant Premier (report here). The JC 1 is capable of drawing current transients of up to 135 amps. How can 135 amps be drawn on a 20 amp circuit? It's easy if the main breaker panel is rated for 200 amps or more and the current transient lasts for a small fraction of a second. Such high level, short duration transients are one of the contributing factors to the realism of reproduced music.

I also had some concern about the Soloist's 15 amp rating. This reply from Bob Stadtherr, PS Audio's engineering vice president, clarified things:

"The 15A rating has more to do with the National Electric Code. The code allows several receptacles to be connected to a single circuit breaker, thus they will not allow any single device to draw the entire load. Some current has to be reserved for other devices plugged into the same circuit, so any one device can only draw 80% of the total. Since the Soloist is considered a power conditioner appliance, it is rated differently from a plain receptacle, and the current specified is for the load rating not the circuit rating.

A receptacle on a 20A circuit would be allowed to have 16A (80%) maximum load connected to it. Honestly we thought a 16A label would cause even more confusion than 15A so we specified it as 15A."

The Soloist's requirement for wall modification prevents some people from trying them. They were easy to install in my two newer AC circuits because the single gang wallboxes were secured to the wall with expandable flanges. Removing them was as easy as turning the retaining screws counter-clockwise and then pulling them out of the wall (see figure 13). Installing a Soloist in these locations only entailed enlarging the hole with a drywall saw and installing the double gang wallbox (double J-box). It took 15 minutes per Soloist. I had to make sure that only a minimum

amount of the stiff Romex wire from the circuit extended into the wallbox. A bunch of this stiff wire, along with the large yellow twist caps, behind the Soloist's bulky rear would have interfered with the Soloist's complete insertion in the wallbox.

The Soloist did not provide an audible improvement when installed in the Power Plant Premier's AC circuit. If it had, replacing the receptacle wallbox on that circuit would not have been trivial since it is nailed to a stud. If it had turned out that I wanted to install a Soloist on that circuit, I would have cut a new hole near the existing outlet and ran Romex wire from the existing outlet to the Soloist's wallbox.

Figure 13. Aftermarket electrical wallboxes are easy to install and remove. Turning the upper and lower screws clockwise raises the retaining flanges and draws them toward the wall.

PS Audio is considering the development of a "plug-in" Soloist version for situations where wall modification is either not allowed or is too difficult. There is no word on when, if ever, this version will be available.

1. Studies On Residential Power Line Noise - Part 6: Continued

Listening Evaluation

Of course, the degree of benefit received from a power line noise reduction device will depend on how "dirty" the power is to begin with. My voltage is stable and the noise content and harmonic distortion is relatively low. In addition to this, the Soloist comes after extensive noise reduction measures such as multiple dedicated AC circuits, low noise power and signal cabling, regenerated AC power and vibration abatement. After these measures, I did not have high expectations for further significant electrical noise reduction via this passive filtering device. The Soloist SE's sonic improvement over the Power Port Premier was immediately heard in some aspects, but I was not initially "wowed" as some have been. The immediate audible improvement between the Soloist Premier and the Power Port Premier was not as great as that between the regular Power Port and the Power Port Premier. Vibration abatement devices provided a much bigger immediate improvement.

The first thing I noticed immediately after installation was a lowered noise floor on the right side as evidenced by apparently higher sound level. My preamp's volume control has approximately 1 dB step adjustments. In order for the sound level to be balanced between the left side Power Port Premier and the right side Soloist Premier SE, I had to decrease the sound level on the right by 4 dB. The regular Power Port sounded veiled compared to the Power Port Premier. Likewise, the Power Port Premier sounded slightly veiled in comparison to the Soloist Premier.

At the time of this evaluation, the Power Port Premiers had over 1000 hours of continuous current through them. In most aspects, the newly installed Soloist Premier on the right side sounded better than the Power Port Premier on the left. Overall clarity, spatiality, image weight, detail and tactile sensation were enhanced. In the bass region, there was an overall "softness". Bass slam, articulation, definition and detail were diminished. This was unexpected. It was as if I had traded bass quality for higher resolution in the midrange and treble. During my Power Port Premier evaluation, I compared a broken in regular Power Port on the left amplifier to a newly installed Power Port Premier on the right amplifier. The improvement in bass performance was the biggest immediate audible change.

Originally Posted by **DarqueKnight**

The right channel P2 was replaced with a P3 and monophonic program material was compared between the left and right channels. The right side was apparently a little louder, indicating a lower noise floor, and the bass was more tactile and defined. Bass instruments had a heavier and more articulate "growl" component. The midrange and treble was also a little clearer.

I might have been "wowed" if I had gone from a regular household outlet to a Soloist Premier or from a regular Power Port to a Soloist Premier or if my power were dirtier to begin with. Furthermore, if I wasn't a bass connoisseur and always on the lookout for well defined macro and micro growls, well delineated layers of bass texture, sharp bass transients and that elusive tactile quality referred to as "bass slam", then the Soloist Premier's initial bass performance would not have been so disappointing.

I assumed that the Soloist's additional wire, capacitors, etc. were dragging its bass performance down and that it would improve with break in. If it didn't, the Soloists were going back.;) During the evaluation of the Power Port Premier receptacles, I noted that their sound continued to improve for the first 150 hours.

When the Power Port Premier was installed, it was such an improvement over the regular Power Port that I quickly replaced all the Power Ports in my two channel and home theater systems. My reservations about the Soloist Premier's bass performance precluded such enthusiastic adoption.

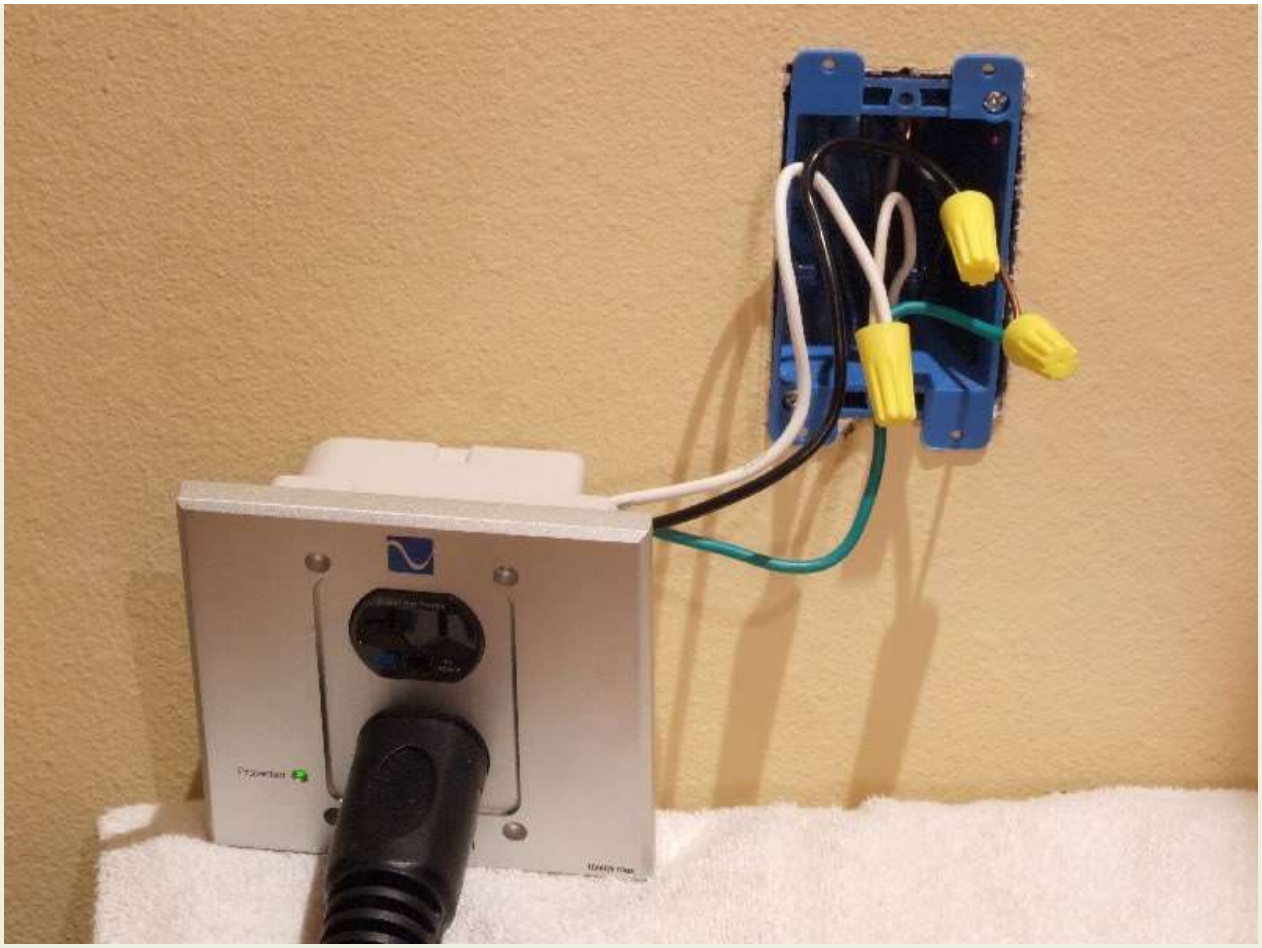


Figure 14. The Soloist Premier SE hangs out for a while. It needed some soak time before it enticed me to enlarge the holes in my wall.

After 50 hours, the bass had improved considerably and I had some glimmer of hope that it was going to work out. After 75 hours, the bass that I'd grown accustomed to started creeping back in. At this point I installed the Soloists in the wall. Immediately after installation, the overall sound became clearer and the bass tightened up a bit. I also began to hear details in familiar recordings that I hadn't noticed before, such as the different varieties of concurrent rumble and growl in Barry White's voice.

At the 100 hour mark, the Soloist's had been used 50 hours for playing music at a moderate level (85-90 dB-C) and had 50 hours of idle current (2 amps continuously) running through them. At this point, the Soloists' performance had significantly surpassed that of the Power Port Premier in every aspect **except** bass performance.

After 150 hours, I still wasn't "back home" in the bass department, but the "fire" and "slam" I had been missing was starting to return. The Soloist's literature claims that it will not restrict current or constrict dynamics. Indeed, my power amps now sounded more dynamic and lifelike with the Soloists in the power chain.

After 175 hours, the Soloist Premier's bass performance equaled that of the Power Port Premier and exceeded it at 200 hours. At 225 hours I noticed more bass slam, more bass definition and more finely detailed bass growl. At 250 hours I heard more background details in the center and center rear of the sound stage.

At the time of this report, The Soloist Premiers had been in use for over 380 hours (192 hours playing music and 188 hours with 2 amps of amplifier idle current running through them). I did not hear further improvements after the 250 hour mark.

Figure 15. The Soloist Premier SE was somewhat of a slow starter, but eventually earned its keep.

Conclusion

I considered some other, more elaborate, more sophisticated, more $$$$, passive filtering options for my power amplifiers, but they all required dealing with additional metal boxes and additional power cords. PSA, in addition to providing a more elegant and lower cost alternative, also provided incentive in the form of quantitative performance data and details on how the Soloist worked. The money back-no questions asked guarantee also helped.

Follow Up

A follow up report will discuss results from installing a Soloist Premier for the plasma television in my home office and for the subwoofer in my home theater. I am waiting fulfillment of the order for those Soloists due to PS Audio running out of Power Port Premiers.:(

The JC 1's are happy about the recent addition power line noise filtering, but would be happier with a dedicated and optimized residential transformer from the power company.

The monoliths are beginning to think that bigger and badder monoblock amps aren't really necessary.

Associated Equipment

01. Pass Laboratories X0.2 Preamplifier
02. Pass Laboratories Xono Phono Preamplifier
03. Parasound Halo JC 1 Monoblock Amplifiers
04. Teres Audio Model 255 Turntable with Acid Etched Holographic Mylar Turntable Belt (DIY), Sonic Purity Concepts and Design Reflex Record Clamp, Graham Phantom B-44 Tonearm, Ortofon MC Windfeld Cartridge and Teres Audio Reference II Turntable Motor
05. Cary Audio CD 306 Professional Version SACD Player
06. Polk Audio SDA SRS 1.2TL Speakers (Hot Rodded)
07. Audioquest LeoPard Tonearm Cable
08. Audioquest Sky XLR Interconnects
09. Audioquest Everest Speaker Cables
10. Signal Cable MagicPower Cord for Turntable Power Supply
11. PS Audio Premier SC Power Cords For Amplifiers and SACD Player
12. PS Audio Statement SC Power Cord for Power Plant Premier
13. PS Audio Power Plant Premier Power AC Regenerator for Source Components
14. PS Audio Soloist Premier SE In-Wall Power Conditioners for Power Amplifiers

15. PS Audio Power Port Premier AC Receptacle for Source Component AC Circuit
16. Three Dedicated 20 Amp AC Circuits
17. Black Diamond Racing Mk4 Cones, Mk4 Mini Black Holes and Jumbo Pits Isolation Devices
18. Salamander Designs Synergy Triple 30 Audio Credenza

1. Follow Up - Soloist Premier With Plasma TV and HT Subwoofer

Soloist Premier SE Results With Plasma Television

I have two Samsung HP-S4273 42" Plasma HDTV's, one in my home office and one in my master bedroom. Each television is connected to a Sony DVP-S9000ES DVD player. The TV in the master bedroom is connected to a PS Audio Power Plant Premier and has a much clearer, smoother and more film-like picture than the one in the home office, which is plugged into the wall. Installing a Soloist Premier behind the home office's TV immediately resulted in a little more color vibrancy and detail on standard DVD's and a moderate increase in color vibrancy and detail with high definition TV programs. When I compared high resolution screen shots of a still DVD image, the picture was also slightly brighter with the Soloist SE. The picture with the Soloist SE was much better than running from the wall, but not as smooth and detailed as with the Power Plant Premier.

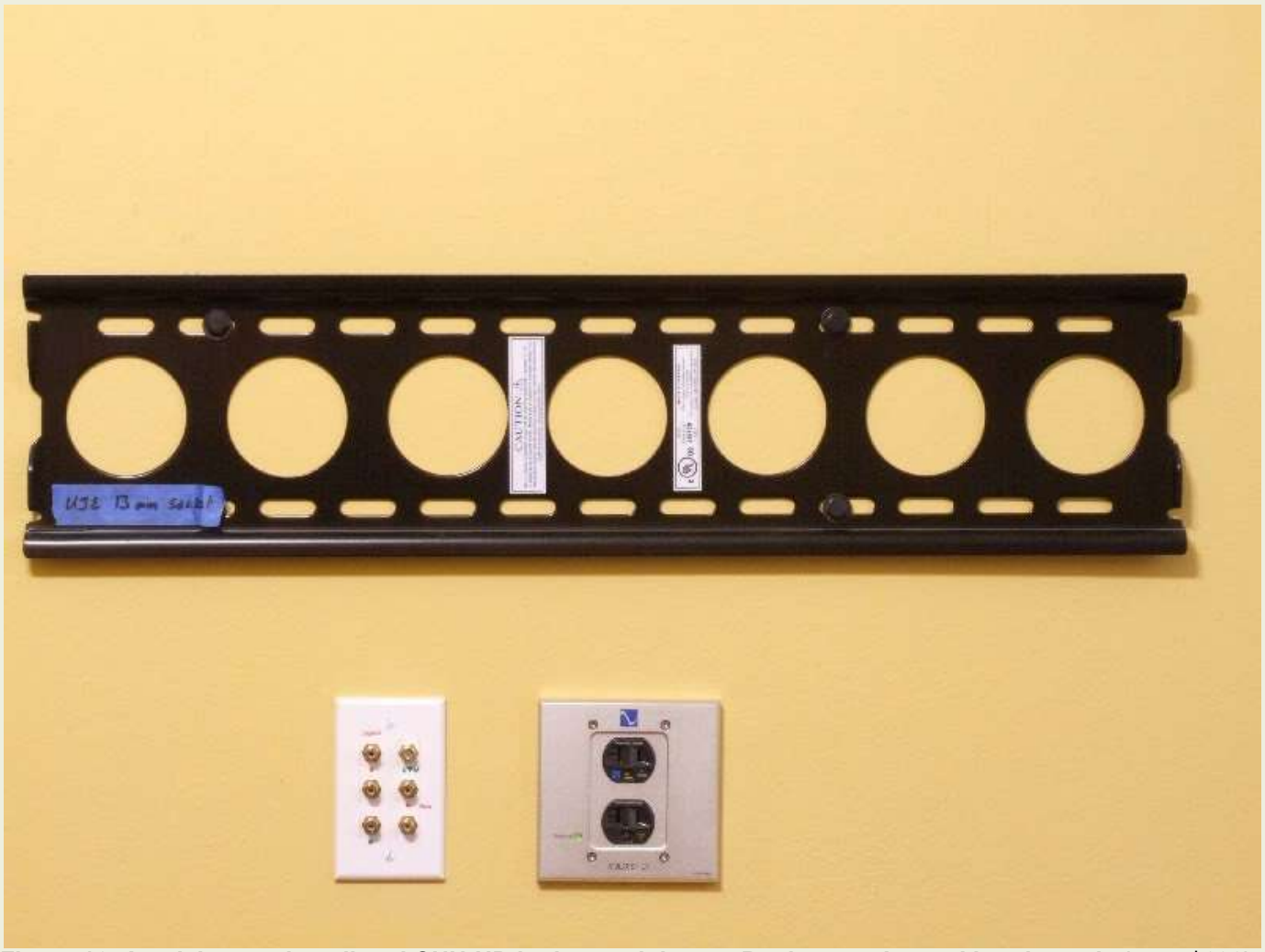


Figure 16. A quick, easy install and CNN-HD looks much better. By the way, I saved handsomely (over $600) by installing the patch panel, outlet and TV bracket myself. These kind of projects make me feel like a real electrician.

Figure 17. Such Good Picture.

Soloist Premier SE Results With Home Theater Subwoofer

My results running the SVS PB12 Ultra/2 subwoofer from a Power Plant Premier are here.

Due to the modest subwoofer improvements with the PPP, I was not expecting big things from the Soloist. Even if there were no audible improvements, the sonically uncompromising surge protection provided by the Soloist would be worth the expense and effort.

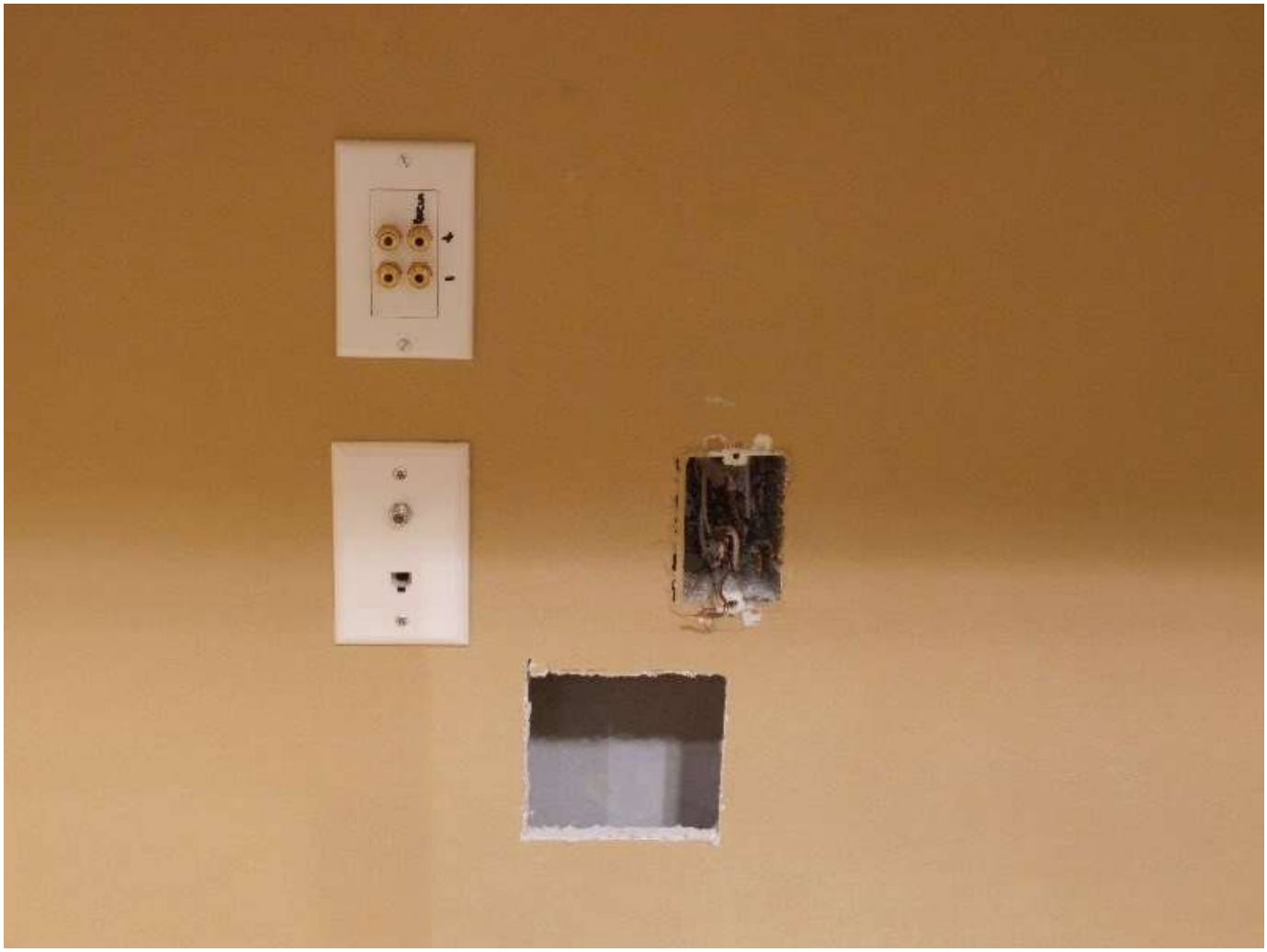


Figure 18. Easy install below an existing outlet.

There was no way I was going to go through the grief of removing the existing single gang box, which was secured to a wall stud. I simply removed one of the punch-out holes in the bottom of the existing wallbox and ran a short piece of 12-2 Romex to the Soloist's wallbox.

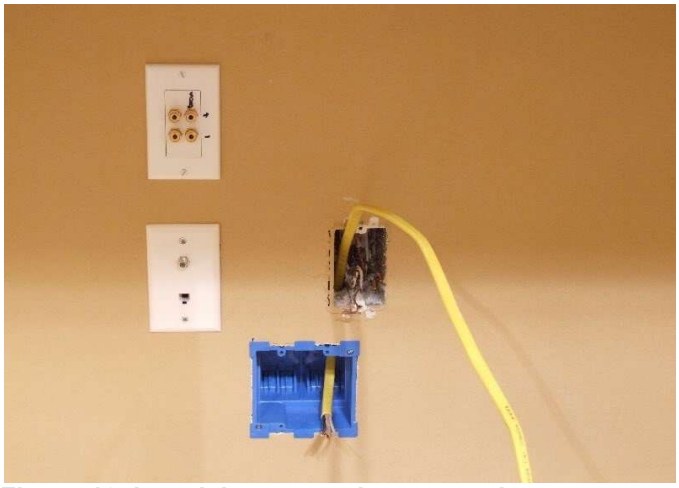


Figure 19. It took longer to clean up and put up my tools than it did for the install.

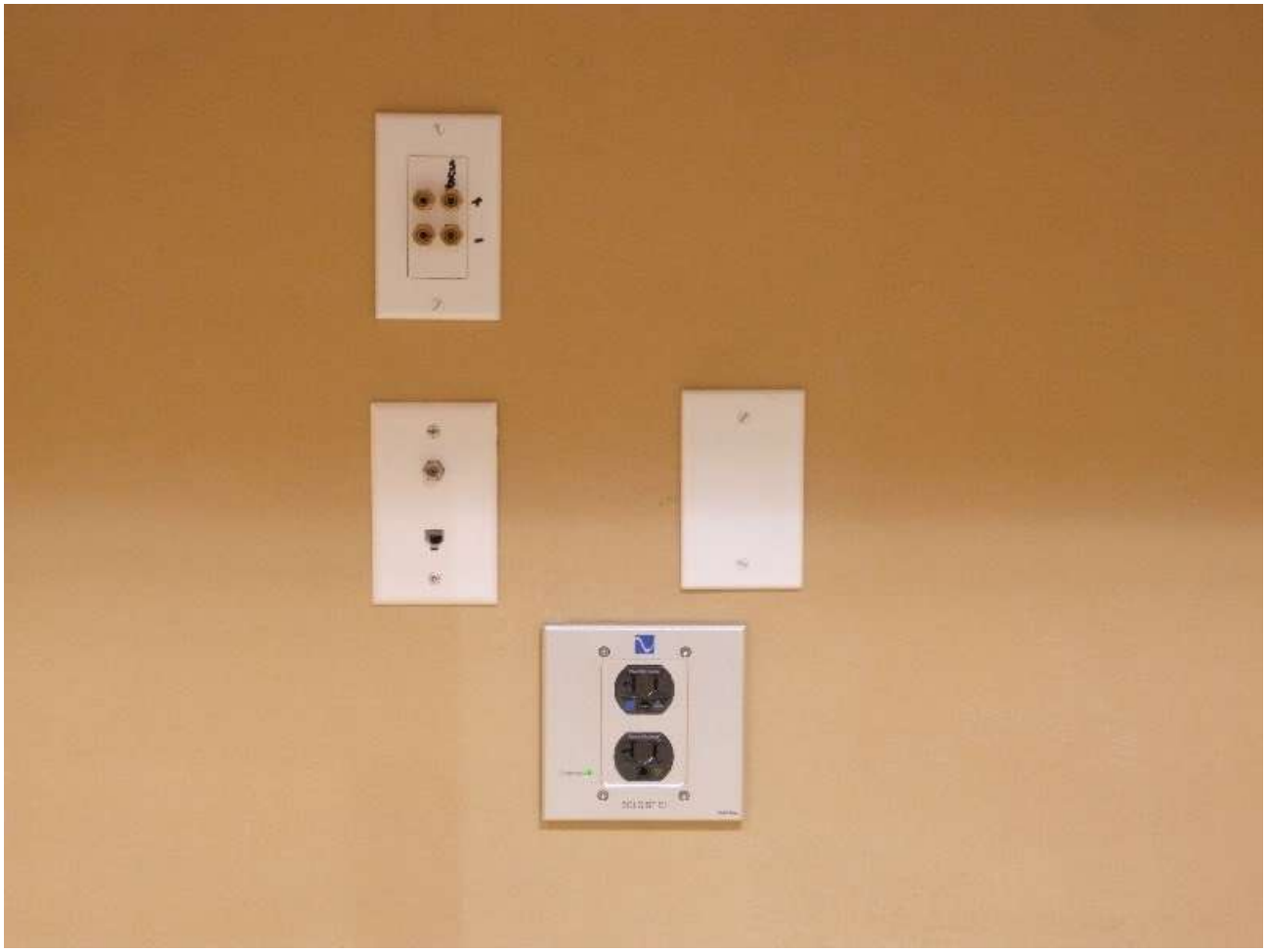


Figure 20. Finished in 20 minutes.

The Power Port in the existing outlet was removed and the wires were connected together with twist caps. When I move to my next house, the process will be reversed: A residential grade outlet will be installed in the single gang wallbox and the Soloist will be removed and its wallbox covered with a wall plate.

Subwoofer Listening Evaluation

The subwoofer sounded apparently much louder due to the lowered noise floor provided by the Soloist. I needed to recalibrate the subwoofer by decreasing the output level by 3 dB. I did not hear an apparent change in the subwoofer's sound level with the PPP.

Subwoofer With Music

I was very surprised at the increase in bass weight, speed and slam immediately provided by the Soloist SE. The increase in speed provided better integration with the smaller, faster drivers in my home theater's front speakers.

I did not hear an immediate improvement in the sub's clarity and detail as I did when it was powered by the Power Plant Premier. Indeed, the PB12 Ultra/2's bass articulation, definition and detail were initially diminished by the Soloist, but not to the degree that I heard with the JC 1 amplifiers. Of course, the plate amplifier of the PB12 Ultra/2 is not as detailed, nimble and agile as the JC 1's, so there was comparatively less damage to be done.

Bass articulation, definition and detail had significantly improved after 12 hours of music and 24 hours of the IsoTek burn-in CD. I thoroughly enjoyed the enhanced subtle rumble coming through the floor, my seat, and my arm rests. I expected things to sound even better after the Soloist had burned in for a couple hundred hours. However, since I seldom listen to music on the home theater system, I did not do further critical listening evaluations after 36 hours.

Subwoofer With Movies

Once the subwoofer's level had been properly re-calibrated, the bass was balanced with the other speakers but the increased tactile sensations still ***felt*** like I had added another sub. This was a good thing.:)

Soloist vs. Power Plant Premier

I wondered why there was such a disparity between the PB12's performance with the Soloist and PPP. In the case of the JC 1 amplifiers, the PPP was stressed by the high current demands. I did not expect that the PB12's plate amplifier (a 1000 watt hybrid Class AB/Class D BASH (Bridged Amplifier Switching Hybrid) design) would stress the PPP, but that might have been the case.

The bass beast is more refined, yet hits harder with the Soloist SE.

1. Follow Up #2 - Soloist SE With Power Plant Premier

Introduction

I decided to revisit the use of a Soloist SE between the wall and the PPP. All of my initial trials demonstrated no difference or improvement when a Soloist was placed between one of my PPP's and the wall.

The test rig shown in figure 1 was used to evaluate the Soloist SE between the wall and the PPP's in my two channel, home theater and master bedroom systems. The Soloist was plugged into the P3 receptacles of the respective systems. In every case, no difference whatsoever was heard. Previously, I did note improvements when a Power Port Premier was placed between the wall and the PPP's. However, during the Soloist power amp trials, I also noted that the sound of the Soloist improved when it was installed in the wall. Accordingly, I decided to give the Soloist a fairer chance and install it in the wall.

Figure 1. Soloist SE test rig.

Additional 20 Amp AC Circuit For 2 Channel System

The AC circuit that powers my 2 channel system source components and preamps is also shared by my wireless networking equipment. The AC circuit is terminated by a PS Audio Power Port Premier (P3) and there is a PS Audio Power Plant Premier (PPP) between the P3 and the source components and preamps. The incoming total harmonic distortion with the wireless equipment on was 3.2%. The outgoing THD to the audio components was 0.4%. Prior to installing the PPP, I could hear a small difference in sound quality between having the networking gear on or off. I always unplugged the networking gear during critical listening sessions. After installing the PPP, I could not hear a difference between the networking equipment being on or off.

I figured this would be overkill, but I installed another 20 amp AC circuit just for the source components and preamps. The incoming THD went down to 2.3% and the outgoing THD went down to 0.3%. The noise floor was lowered a bit and the bass sounded a bit faster.

Since times are hard, I did not engage the services of my electrician, who charges $425 to install a new AC circuit. I did this one myself. The holes in the wall were already there from the previous two additional circuits. I just ran the additional wire next to that of the wire for the right side JC 1 amp AC circuit. I removed the JC 1's Soloist and attached a 13 foot length of Romex to the end of the circuit cable. I then pulled this up to the attic and attached the new circuit wire. All this was pulled back down through the outlet opening in the wall. The only difficulty was getting the Romex cable down to the sub panel in my garage. The wall space above the sub panel is crammed with wire and insulation which makes fishing wire a challenge. When the electrician came to install the first additional circuits, he said that, because of the wire congestion, he might have to remove a portion of the drywall to access the top of the sub panel cabinet. He was able, with some difficulty, to run wire for four new AC circuits without having to cut into the wall.

For this run, the hole in the top of the wall was just large enough to insert the Romex and the wall fishing rod. It took two hours to maneuver the end of the cable to one of the unused access holes in the sub panel cabinet top. Things would have gone faster if I had had someone in the attic to push and pull the wire when needed. If I decide to add any additional AC circuits, I will have to cut into the drywall to access the top of the sub panel.

The cost to add the additional AC circuit was $39.61:

$30.97 for 100 feet of 12-2 Romex cable (82 feet were used).
$3.47 for a 20 amp breaker.
$5.17 for a residential grade receptacle. The Power Port Premier that was on the former circuit was replaced with a regular receptacle since the networking equipment did not require a high quality receptacle. The Power Port Premier was placed in storage.

Some Results

With the Soloist in the wall, I heard a further small reduction in the noise floor and a small increase in overall detail. I began hearing subtle percussion details in familiar recordings that I had missed before. There was also an enhanced growl effect to some bass notes.

I will follow up again after the recommended 200 hour break in.

Figure 2. The additional AC circuit and Soloist SE turned out to be worthwhile efforts.

Soloist Premier SE Quality Control Issue

Last month, after installing a Soloist SE, I noticed the green LED was not't lit. A check with a voltmeter showed that I was getting 122 volts out. I thought something was wrong with the LED or the protection circuitry. I emailed PSA customer service about the problem. Then I took the back cover off and this is a picture of what I found:

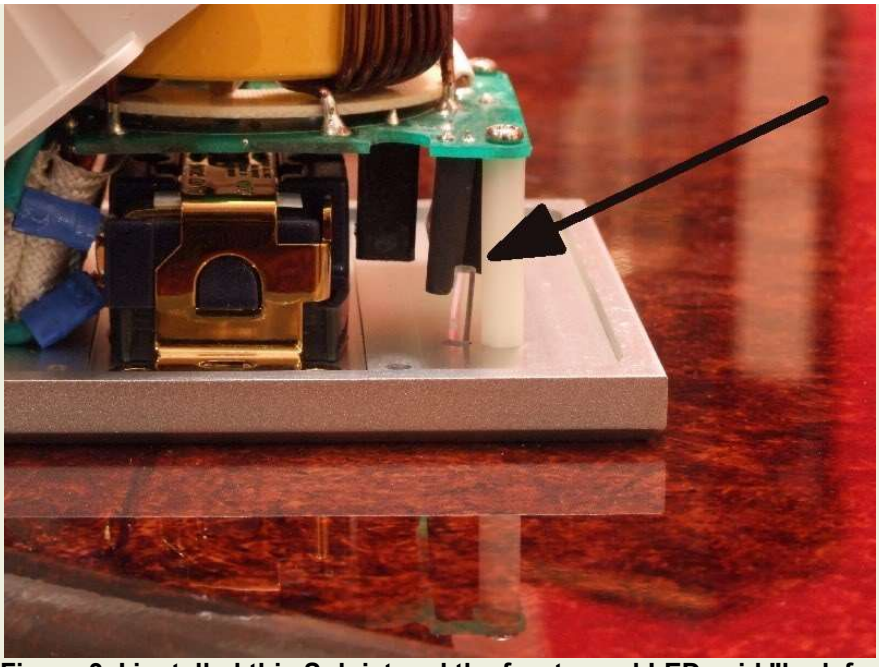


Figure 3. I installed this Soloist and the front panel LED said "look for me".

The black plastic light guide shroud that connects the green LED to the clear plastic lens was on the LED but not on the lens, therefore no green light could be transmitted to the front panel.

I recently ordered two more Soloist SE's and, after installation, no green light. A check with the voltmeter showed that I was getting 122 volts out. This time I had a good idea what the problem was, so I removed the Soloist and took off its back cover. This is a picture of what I found:

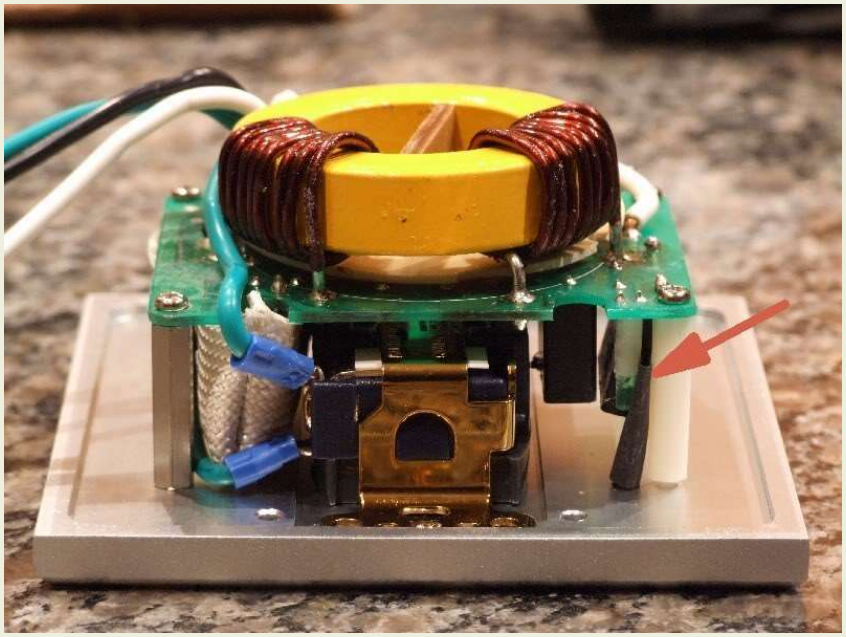


Figure 4. Come on Paul, stop playing hide and seek with the LED display.

This time the shroud was on the LED but not on the lens.

It only took 10 minutes to correct this, but I don't understand why something this obvious was not caught in final inspection and testing. I have six Soloist SE's and two of the six had this problem.

1. Follow Up - PPP Soloist SE After 200 Hour Break In

With the Soloist SE in the Power Plant Premier's (PPP) AC circuit, I could not discern the day to day improvements that I heard with the Soloists in the JC 1's AC circuits. I just knew that I liked what I was hearing.

I noted this immediately after installing the PPP's Soloist SE:

Originally Posted by **DarqueKnight**

With the Soloist in the wall, I heard a further small reduction in the noise floor and a small increase in overall detail. I began hearing subtle percussion details in familiar recordings that I had missed before. There was also an enhanced growl effect to some bass notes.

I decided to fall back to the residential grade receptacle located below the PPP's Soloist, then replace that receptacle with a Power Port Premier (P3), then replace the P3 with a Soloist SE.

Figure 1. "Interesting" sound difference: PPP plugged into a residential grade outlet.

Figure 2. Much, much better: PPP plugged into a Power Port Premier.

Figure 3. Best by far: PPP plugged into a Soloist Premier SE.

Trial 1: Plugging The PPP Into A Residential Grade Outlet

Going from the Soloist SE to the residential grade outlet produced an "interesting" contrast in sound. The apparent sound level was substantially lowered and the entire sound stage was draped in a veil. Image weight was reduced and the width of the sound stage was diminished by 2 feet on each side. The detail in images at the sides and rear of the sound stage was obscured. The subtle micro growl effects in some bass notes disappeared, although the macro growls were still there, but less well defined.

Trial 2: Plugging The PPP Into A Power Port Premier

Replacing the residential grade outlet with a Power Port Premier restored the sound stage width and improved image weight. Tactile sensations were substantially improved. The sound level was apparently louder and overall detail was significantly improved.

Trial 3: Plugging The PPP Into A Soloist Premier SE

Plugging the PPP into the Soloist SE resulted in a further lowering of the noise floor as evidenced by an increase in apparent sound level. Images within the sound stage increased in weight and overall detail and there was an enhanced sense of three dimensionality and inky black background.

Tactile sensations were further enhanced, particularly in the bass region. The bass micro growls returned and the macro growls were more defined and enhanced.

Conclusion

In my experience, the Soloist Premier really needed its recommended 200 hour break in time. I am biased toward components that start out sounding good and get better with age. The Soloist SE's in my two channel system sounded "passable" upon first installation and steadily improved. The wait time, coupled with the requirement for wall modification, might be a deal breaker for some.

Part 7

1. Studies On Residential Power Line Noise - Part 7: HiFi Tuning and Isoclean Fuses

Introduction

I first tried some Isoclean audio grade fuses in January of 2008 (Isoclean Review). I replaced the 12 amp power line fuses in my Parasound Halo JC 1 monoblock amplifiers. I am far more impressed with these fuses now than then. The AC power infrastructure and vibration abatement improvements implemented in the fall of 2008 provided new levels of resolution that made the benefits of these fuses more apparent.

Isoclean fuse at top left and HiFi Tuning fuse at right. Their stock counterparts are below them.

Although the power amp fuses are the same, my audio power infrastructure is vastly different. In January of 2008, I

did not have multiple dedicated AC circuits, multiple passive AC conditioners, an AC regenerator, and low noise power cords. I did not start AC infrastructure upgrades until August of 2008.

Now, switching back to the stock power amp fuses was the visual equivalent to going from a well lit room to dimming the lights a quarter way down. Tactile sensation and sound stage width and depth was also significantly reduced.

Oscilloscope measurements revealed that these fuses are actually **noise filtering/power conditioning devices** in addition to protection devices. I speculate that the manufacturers of audio grade fuses do not describe them as power conditioning devices because:

1. They would have to describe the proprietary filtering mechanism in more detail than they care to.

2. Classifying the fuses as power conditioning devices would add another layer of regulatory approval (and more costs to the manufacturer).

Both the HiFi Tuning and Isoclean fuses have arrows on their cases which indicate that they should be oriented in the direction of current (energy) flow. Some people have scoffed and ridiculed the idea of "directional" AC fuses. Rather than something to ridicule, I saw the arrows as indications that there was something going on inside the "fuses" that required a specific orientation. Initially, my ears told me that the fuses sounded better in the direction of the arrows than against it. Noise spectrum measurements with an oscilloscope verified that the line noise was lower in the direction of the arrows than against it.

I sent the following email to HiFi Tuning's offices in Germany:

I tried a 0.5 Amp Hifi Tuning fuse in my Pass Labs Xono phono preamp and Pass Labs X0.2 line level preamp. The results were spectacular.

Listening tests confirmed that the best, most detailed, most open sound was achieved when the fuses were installed with the logo pointing in the direction of current flow.

I also took some noise spectrum measurements with an oscilloscope and I definitely saw more power line noise after the fuse when it was installed with the logo pointing against the current flow.

The resistance of the fuse measured the same in both directions.

What is it about the Hifi fuse's construction that makes it directional?

I received this response the same day:

Thanks for the Feedback,

Please understand that a magician never tell anybody his tricks....;.-)
But be sure that we made the best fuses on the planet, nobody can make it better!!!

Regards,

Bernd Ahne

I sent the following email to Isoclean's offices in Hong Kong:

"What is the electrical theory behind the reason why the IsoClean fuses need to be installed in one direction for best sound quality?"

I received this reply:

Dear Sir,
The meaning is same as arrow direction in signal cables. Always want to keep same direction as indicated.
Hope you understand.
Regards
Isocleanpower

The only thing I understood from Isoclean's response was that they just wanted me to go away.

Fortunately, as a result of my power line noise reduction research, I had become aware of physicist Jack Bybee's

pioneering research in materials-based noise reduction using special metal oxides and ceramics. His research was focused primarily on "quantum purifiers" which reduced noise at the **quantum** level rather than the gross level (RF, EMI). Bybee filters are used in every aspect of high end audio gear, from speakers, to amps, to source components to turntable motors. My Teres Reference II turntable motor uses Bybee noise filters. It is apparent that these audio grade fuses employ Bybee or a similar materials-based noise reduction technology. The interested reader can find further information on this fascinating technology at the Bybee Technologies Website and numerous other online resources. Just do a search on "Jack Bybee", "Bybee purifier", or "quantum purifier".

A lot of HiFi Tuning's website is in German, but I was able to glean enough information to tell that they are heavy into materials-based noise reduction products.

Better Understanding

At the time of my initial purchase of Isoclean audio grade fuses in January of 2008, I did not have a good understanding of what they were doing. I clearly heard improvements and I also heard the fuse's better performance in one direction than the other. It was only after I took noise spectrum measurements that I came to realize that these devices, rather than being mere "fuses", are actually noise gates and resolution enhancement devices. Accordingly, in an audio system with appropriate resolution capability, they provide benefits well in excess of their cost. I was initially stung by what I considered to be high prices for these "fuses" ($25 to $45). Now, in light of what they actually do, and my better understanding of noise reduction science, I realize they are one of the most effective **low cost** resolution enhancement tweaks you can buy. Please be aware that, as with any electrical noise reduction device, your results will vary according to your associated equipment and power line quality.

Listening Evaluation

The improvements that the Isoclean fuses brought to my power amps were very obvious. The improvements that the HiFi Tuning fuses brought to my line level and phono preamps were transformational, with respect to sound stage width and depth, dynamics, overall detail and tactile sensation, with the phono preamp benefiting more so than the line level preamp. The phono preamp has a much lower noise characteristic than the line level preamp. This makes noise reductions, even small ones, easier to discern.

Replacing the stock 1A wire wound fuse in my Pass Labs X0.2 preamp with a HiFi Tuning fuse resulted in a dramatic improvement in sound stage dimensions and quality as shown in figure 1.

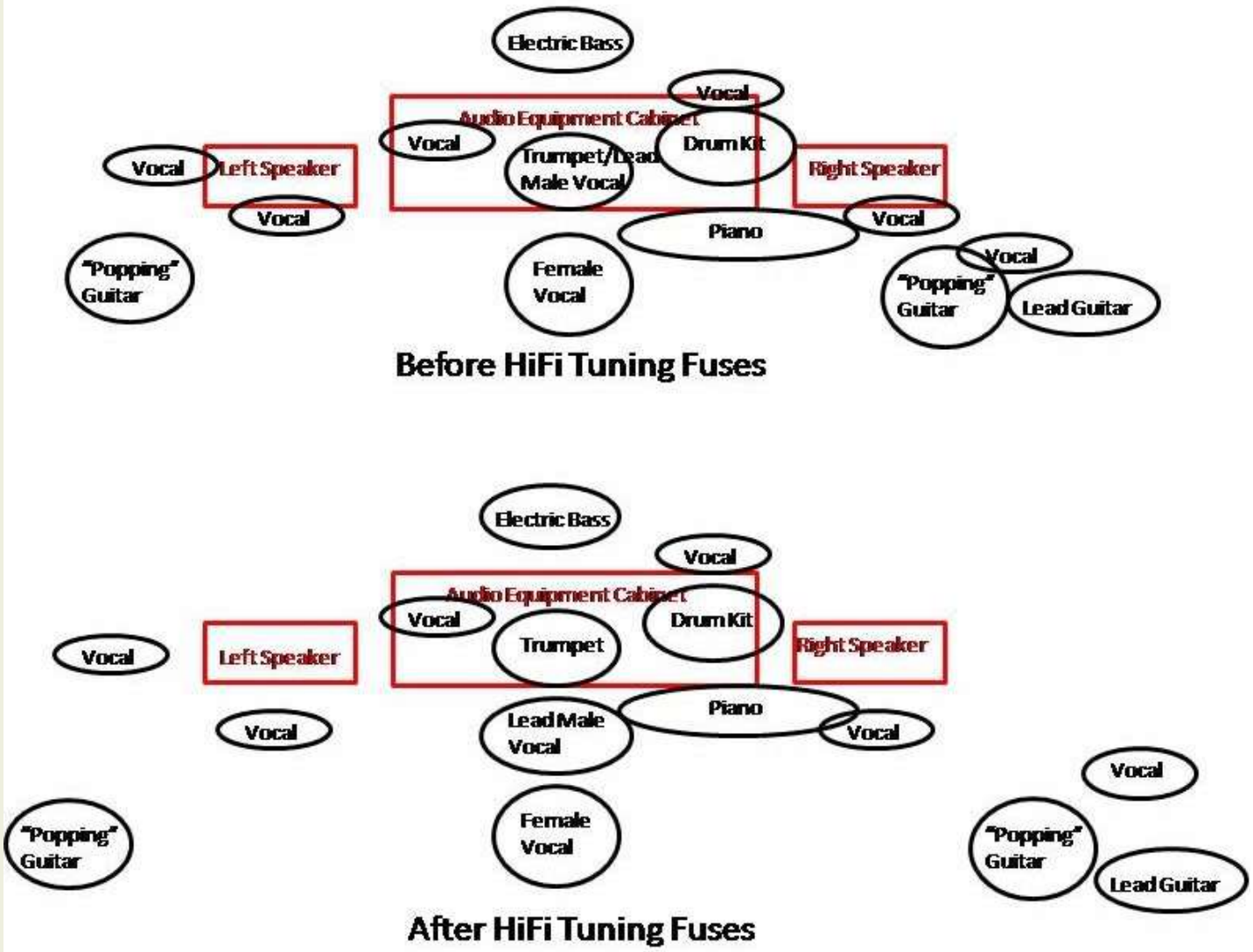


Figure 1. Sound stage dimension changes after preamp fuse upgrade.

Figure 1 shows the changes in instrument and vocal locations before and after the HiFi Tuning fuse installation for the CD version of the song "Funkin' For Jamaica (NY)" by trumpeter Tom Browne (released in 1980).

"Funkin' For Jamaica (NY)" comprises a layered mix of well recorded and spatially stable audio images. The band members engage in dialog talking about events from their everyday lives in Jamaica, New York as well as comments about the physical attributes of the female vocalist and comments about trumpeter Tom Browne's personality and his dedication to music. The band member's voices are scattered across the sound stage.

Under everything is a constant, heavy, growling electric bass beat. On the left and right of the sound stage are identical constant "popping" effects which sound like they are made by a guitar, but it might have been a synthesizer since a synth is listed in the song's instrumentation list. There is an electric lead guitar to the far right which only plays accent notes at the end of the vocalist's phrases.

Before

Before installation of the HiFi Tuning fuses in the Pass Labs X0.2 preamp, Tom's Browne's trumpet and the lead male vocalist shared the same space. The "popping" guitars, female vocalist and the lead electric guitar were 3 feet ahead of the speaker plane. There was a band member's voice coming from the space directly in front of each speaker.

After

Everything is apparently louder, certainly clearer and definitely more **dynamic**.

The female vocalist, popping guitars and lead guitar came forward 2 feet for a total of five feet ahead of the speaker plane.

The lead male vocalist now had his own clearly defined space between the female vocalist and the trumpet.

The band member's voice that was on the left edge of the left speaker was pushed to the left by 1 foot.

The band member's voices in front of each speaker were repositioned a foot further forward.

The vocal/popping guitar/lead guitar grouping on the right were repositioned 2 feet further to the right.

The electric bass growl was faster, more detailed, and much heavier...it was now more reminiscent of an animal's growl than that of an electric instrument...and had more textures. Individual bass notes had more clearly defined trailing edges and decay.

The popping guitar's pops were heavier, more sharply defined and more percussive.

1. Residential Noise Part 7 - Continued

With the stock fuses, the band member's conversation had just a hint of recording space natural reverberation. It almost sounded like they were standing outside talking. With the new fuses, the reverberant envelope around each speaker and each instrument (particularly the popping guitars) was clearly defined. Subtle echoes off the rear and sides of the recording space were greatly enhanced.

Tom Browne's muted trumpet had more metallic "bite" with a stronger, thicker, clearer tone.

I now heard a slight raspy edge in the female vocalist's Chaka Khan-ish voice that I had never noticed before.

Piano notes were heavier, had more decay and more natural "sparkle".

The drum kit licks were faster, better defined and more natural sounding.

All of the above was facilitated by the addition of a $40 "fuse". I say facilitated because the excellent improvements realized were due to a synergistic interaction of extensive power infrastructure tweaks rather than the effect of the HiFi Tuning fuse alone. For example, after listening with the X0.2's replacement fuse in place, I replaced the right power amp's Isoclean fuse with the stock ceramic fuse and heard the following:

1. The lead male vocalist went back to sharing the same space with the trumpet.

2. The female vocalist was repositioned at the edge of the speaker plane. Her raspy vocal edge was gone.

3. The reverberant characteristics of the images on the left of the sound stage were retained but the reverberant characteristics of the images on the right were greatly diminished or disappeared altogether.

4. The growling bass guitar lost a bit of speed and definition.

5. The right side of the sound stage sounded "darker" overall.

6. The right side of the sound stage contracted by 3 feet.

7. Overall tactile impact was diminished.

When listening to the "Take Five" track on the 180 gram pressing of Dave Brubeck's "Time Out" LP, replacing the Pass Labs Xono phono preamp's 0.5A stock wire wound fuse with a HiFi Tuning fuse resulted in the following improvements:

1. More subtle rumbling overtones on drums and acoustic bass.

2. Paul Desmond's alto saxophone shifted 1 foot to the right and 1 foot forward.

3. Saxophone notes had a more airy, reedy tone quality.

4. Piano notes had more weight and decay.

5. More bass slam.

6. Much sharper transients and more liquidity on rapid drum licks.

7. Much lower noise floor as evidenced by apparently louder sound level.

Replacing the JC 1 power amp's 1A stock wire filament rail fuses resulted in a further widening of the sound stage by two feet, a further lowering of the noise floor, and a small increase in detail and image weight.

In every case, the audio grade fuses sounded better than the stock fuses <u>even when they were oriented the wrong way</u>.

When I replaced the Cary CD 306 Professional Version SACD player ($8,000) with my Adcom GCD-750 CD player ($1,500), I heard the following changes:

1. Significant loss of tactile bass.

2. Bass growls were blurred. Rather than electric bass notes with the throaty, well defined rumble of a tiger's growl, the electric bass notes were now more similar to stomach rumblings.

3. Overall detail was diminished.

4. Sound stage depth and width significantly shrank (by 3 feet all around).

5. Bass seemed slower.

Now, I don't want to give the impression that the sound became "bad" when the Adcom replaced the Cary. It didn't. It was just less good by comparison, but still very, very, good.

Quantitative Analysis

A total of 16 fuses (8 stock fuses and 8 audio grade replacements) were evaluated: a 12A power line and two 1A rail fuses in each of the JC 1 power amps and 0.5A power line fuses in the Pass Labs X0.2 and Xono preamps. The differences seen in noise content between the stock and audio grade fuses was consistent. The oscilloscope used was a Tektronix TDS 2012.

The stock fuses are the slow blow type. Isoclean only makes slow blow fuses. HiFi Tuning makes both slow blow and fast blow fuses and offers a wider variety of current ratings than Isoclean.

The oscilloscope's Fast Fourier Transform noise spectrum plots in figures 2-6 follow the power signal as it comes from the PS Audio Soloist SE in-wall conditioner all the way to its exit from the JC 1's power line fuse. Both the stock ceramic fuses and the Isoclean fuses were compared.

The y-axis is the magnitude in dB and the x-axis is the frequency in Hertz. FFT measurements were taken with a Tektronix TDS 2012 digital oscilloscope. Starting at the y-axis and going from left to right the five large red spikes are: the DC component directly on the y-axis, the next and largest spike is the 60 Hz power signal, next is the 3rd harmonic at 180 Hz, next is the 5th harmonic at 300 Hz, last is the 7th harmonic at 420 Hz.

The 1-1/4" x 1/4" fuses were placed in a Radio Shack 20 Amp in-line fuse holder with 12 gauge stranded wire leads (part #270-1217). One fuse holder lead was plugged into the end of the power cable and the oscilloscope probe was connected to the other fuse holder lead. I did not use a fuse holder with the smaller 5mm x 20mm JC 1 rail fuses. Alligator clip leads were used.

The differences in the plots are easier to see if you save them to your hard drive and step through them.

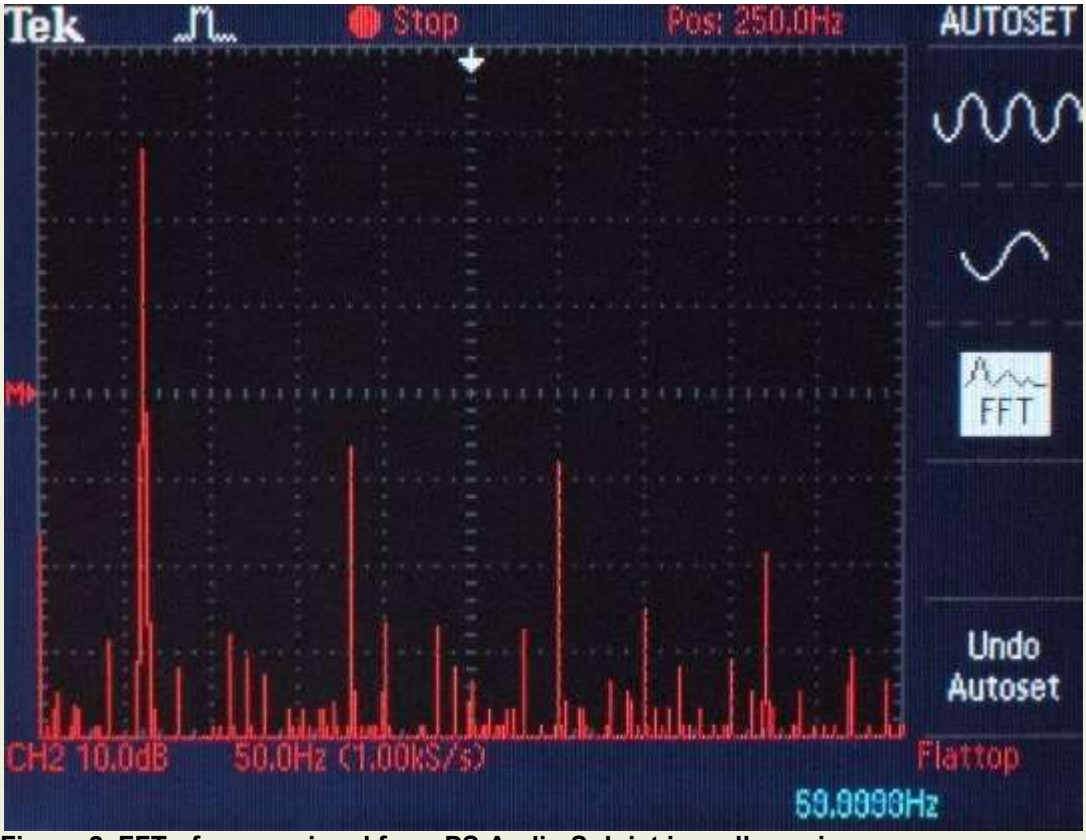


Figure 2. FFT of power signal from PS Audio Soloist in-wall passive power conditioner.

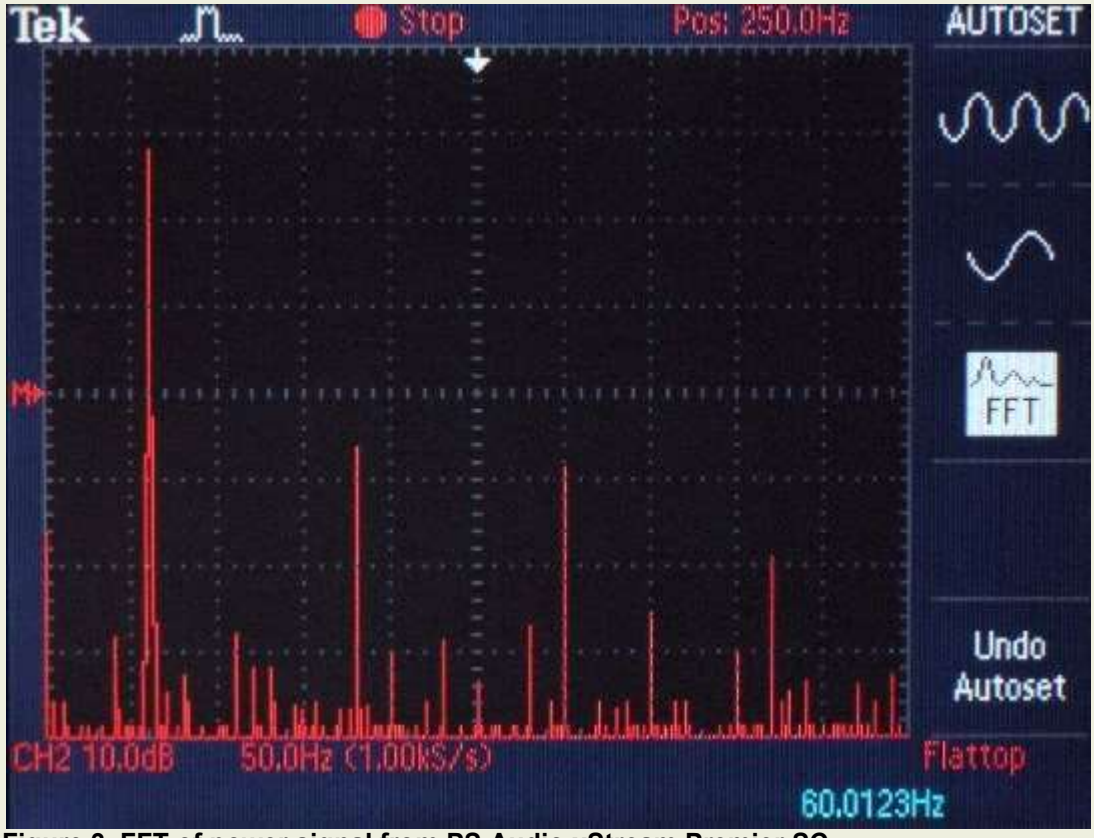


Figure 3. FFT of power signal from PS Audio xStream Premier SC power cord.

The power signal FFT plot after the Premier power cord displays an overall flatter noise spectrum with slightly less amplitude in the 5th and 7th harmonic.

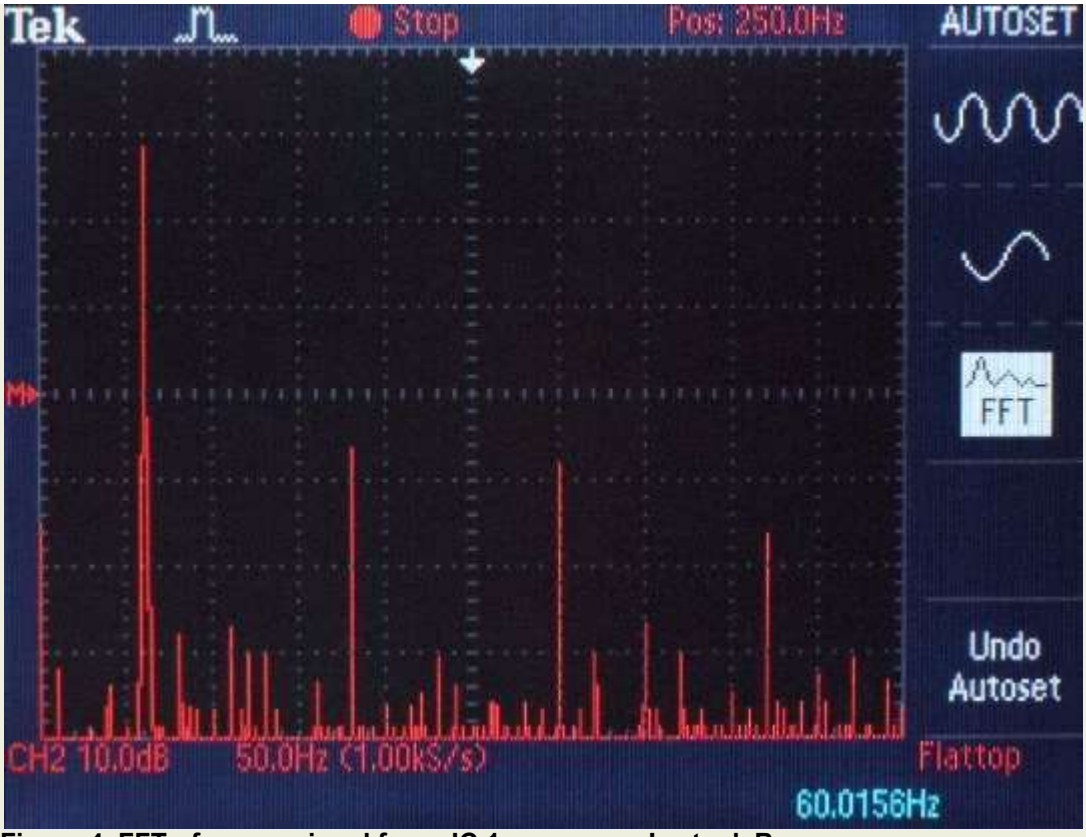


Figure 4. FFT of power signal from JC 1 power amp's stock Bussman MDA ceramic power line fuse.

The power signal FFT plot from the JC 1's stock Bussman MDA ceramic power line fuse showed an increase in overall line noise, particularly at the 5th and 7th harmonic.

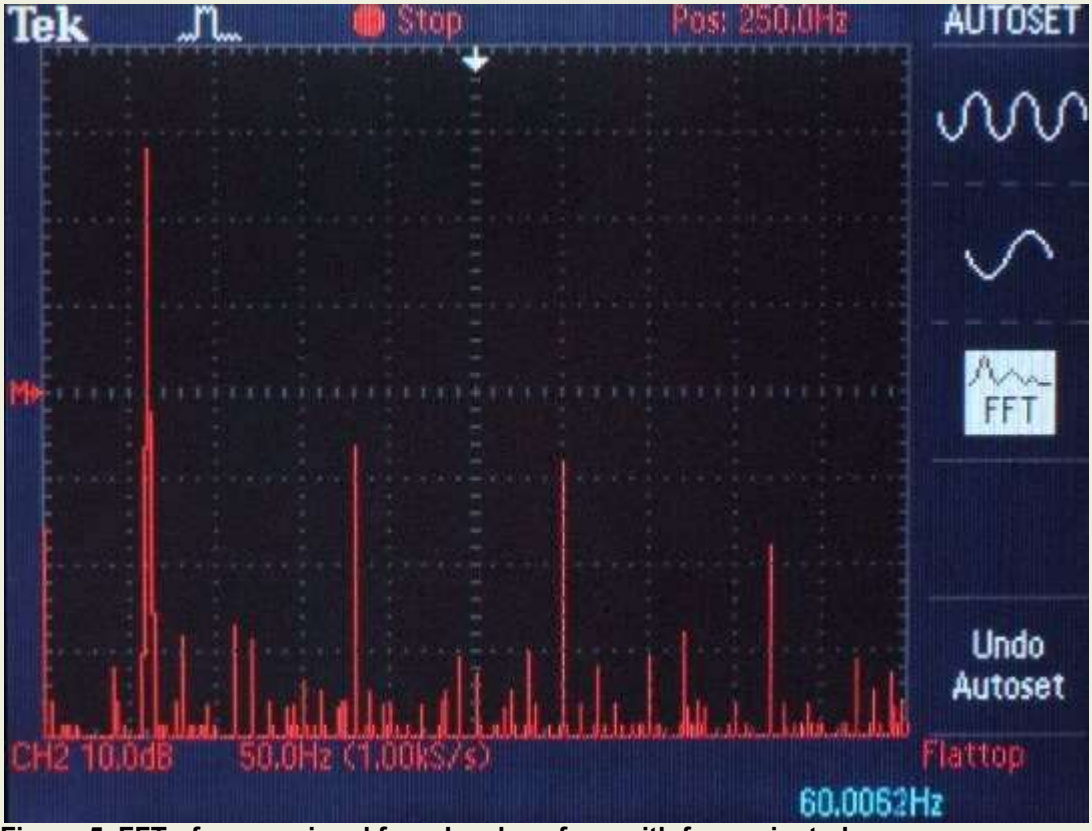


Figure 5. FFT of power signal from Isoclean fuse with fuse oriented against current flow.

Inserting the Isoclean audio grade fuse in the reverse direction showed similar noise characteristics to the MDA

ceramic fuse.

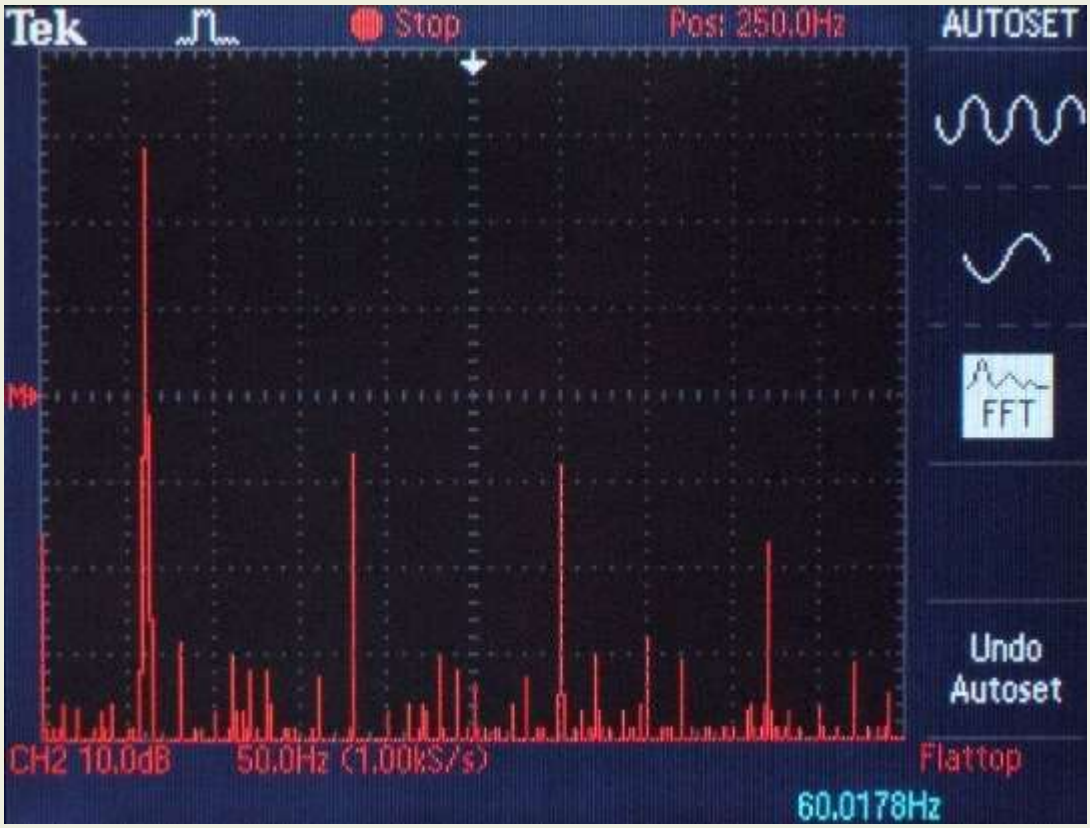


Figure 6. FFT of power signal from from Isoclean fuse with fuse oriented with current flow.

Inserting the Isoclean fuse in the forward direction resulted in a further lowering of line noise amplitude and density over that provided by the Premier power cord.

Figures 7-9 show the FFT plots for the stock X0.2 preamp fuse and its HiFi Tuning replacement fuse.

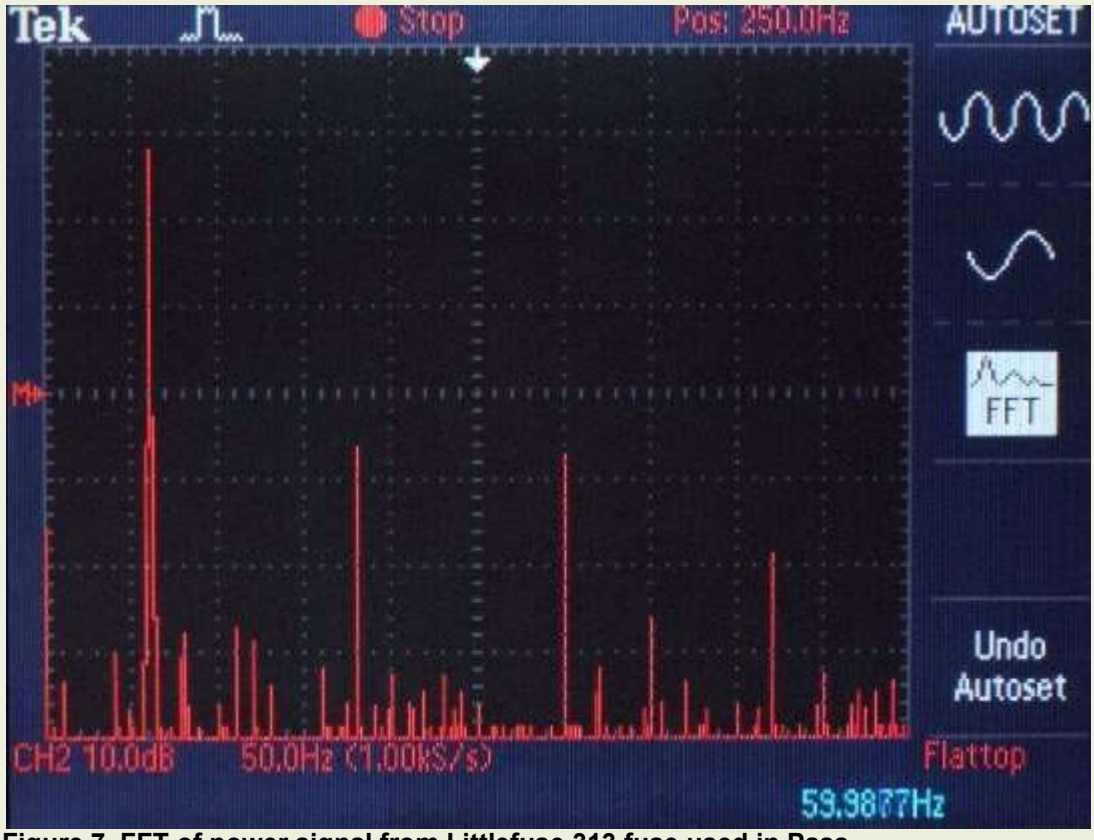


Figure 7. FFT of power signal from Littlefuse 313 fuse used in Pass

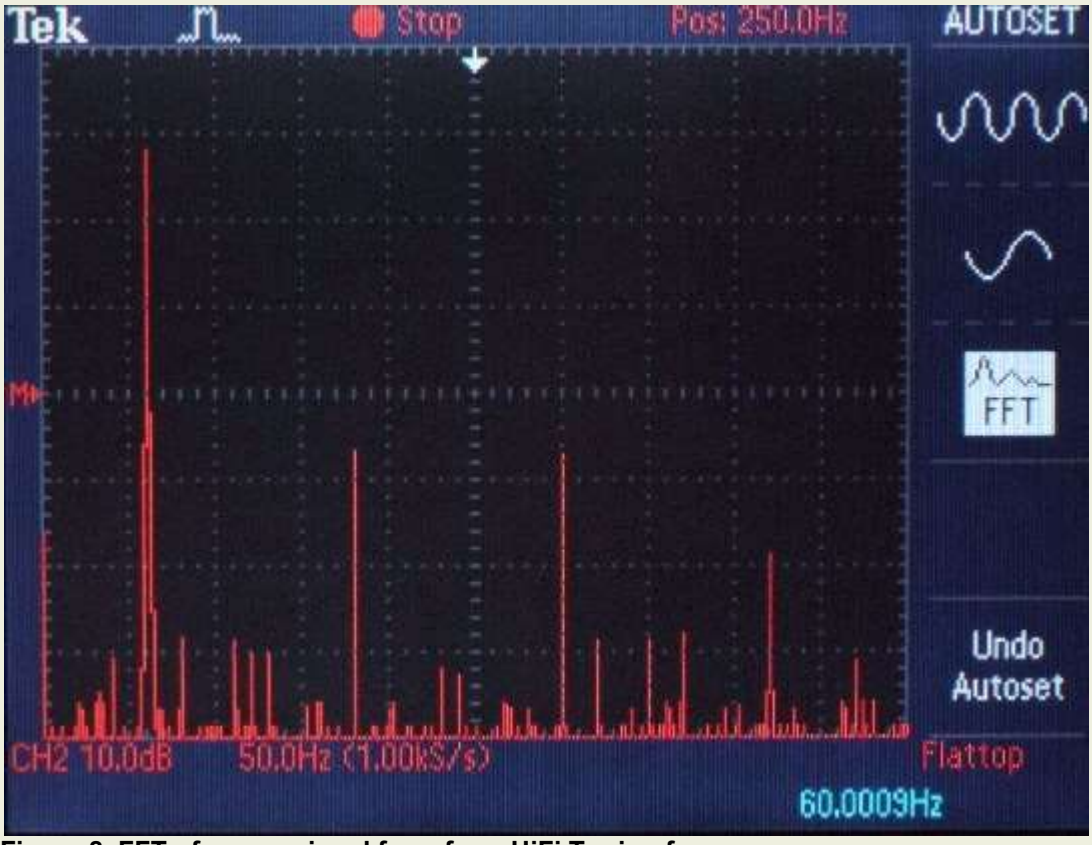


Figure 8. FFT of power signal from from HiFi Tuning fuse oriented against current flow.

The HiFi Tuning fuse in the reverse direction displayed similar noise characteristics to the stock fuse.

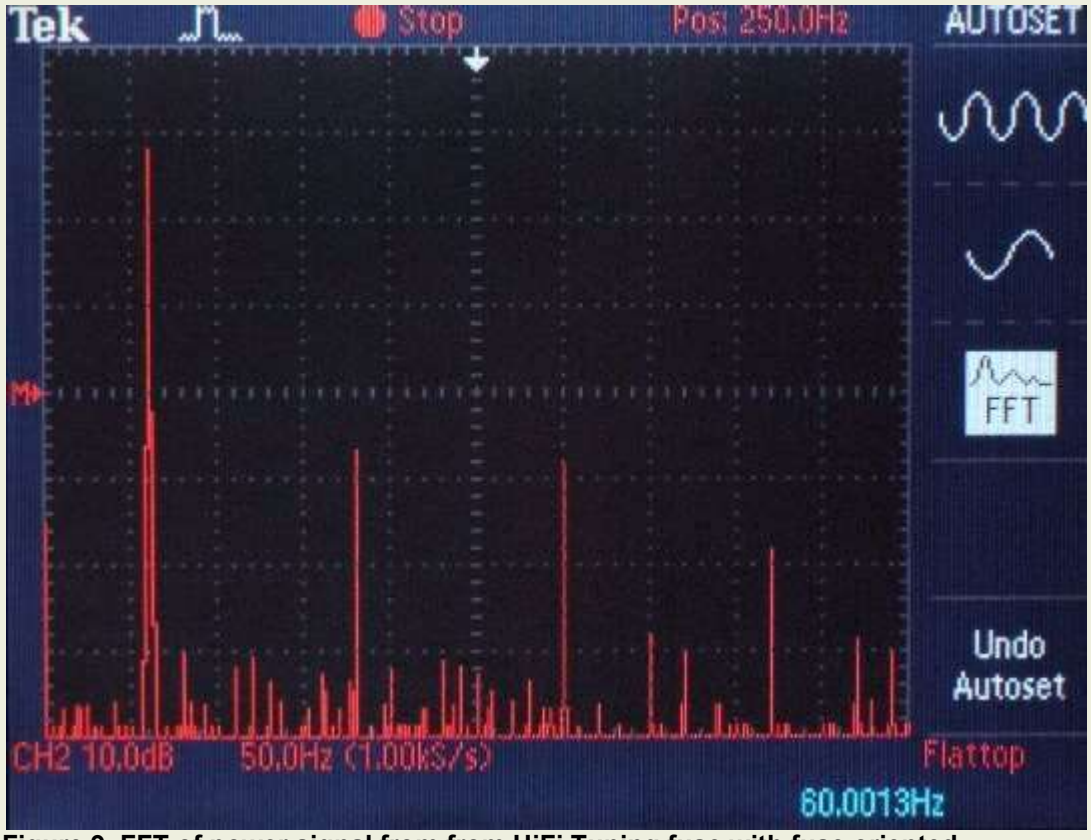


Figure 9. FFT of power signal from from HiFi Tuning fuse with fuse oriented with current flow.

Orienting the HiFi Tuning fuse in the direction of current flow resulted in a significant reduction in noise amplitude.

In every report I have read where Isoclean and HiFi Tuning fuses were compared, the Isoclean fuses came out on top. I did not compare Isoclean and HiFi Tuning fuses in the same component. I would not have ordered the HiFi Tuning fuses were it not for the fact that Isoclean does not make a 0.5 Amp 1-1/4"x1/4" fuse. Comparing figures 6 and 9, the Isoclean and HiFi Tuning fuses have comparable noise amplitudes but the Isoclean fuse has overall lower noise density.

1. Residential Noise Part 7 - Continued

Figures 7-9 showed the FFT plots for the stock X0.2 preamp fuse and its HiFi Tuning replacement fuse connected to the end of a Premier SC power cord which was connected to a Soloist in-wall power conditioner. Figures 10-13 show the FFT plots for the stock X0.2 preamp fuse and its HiFi Tuning replacement fuse connected to the end of a Premier SC power cord which was connected to a Power Plant Premier (PPP) AC regenerator. The spectacular improvements I heard after installing the HiFi tuning fuses in the X0.2 preamp and Xono phone preamps were attributable in part to the already exemplary low noise environment provided by the PPP. For a brief instant in time, I considered taking the PPP out of the power chain in order to hear just how much of a difference it was making. In the end, I just wasn't brave enough to do that. Besides, I wasn't going to listen to my preamps without the PPP, so why bother?

Figure 10. Power signal coming from the PPP through a Premier SC power cord. Note the dramatic reduction in harmonic and other noise compared to that seen in figures 2-9.

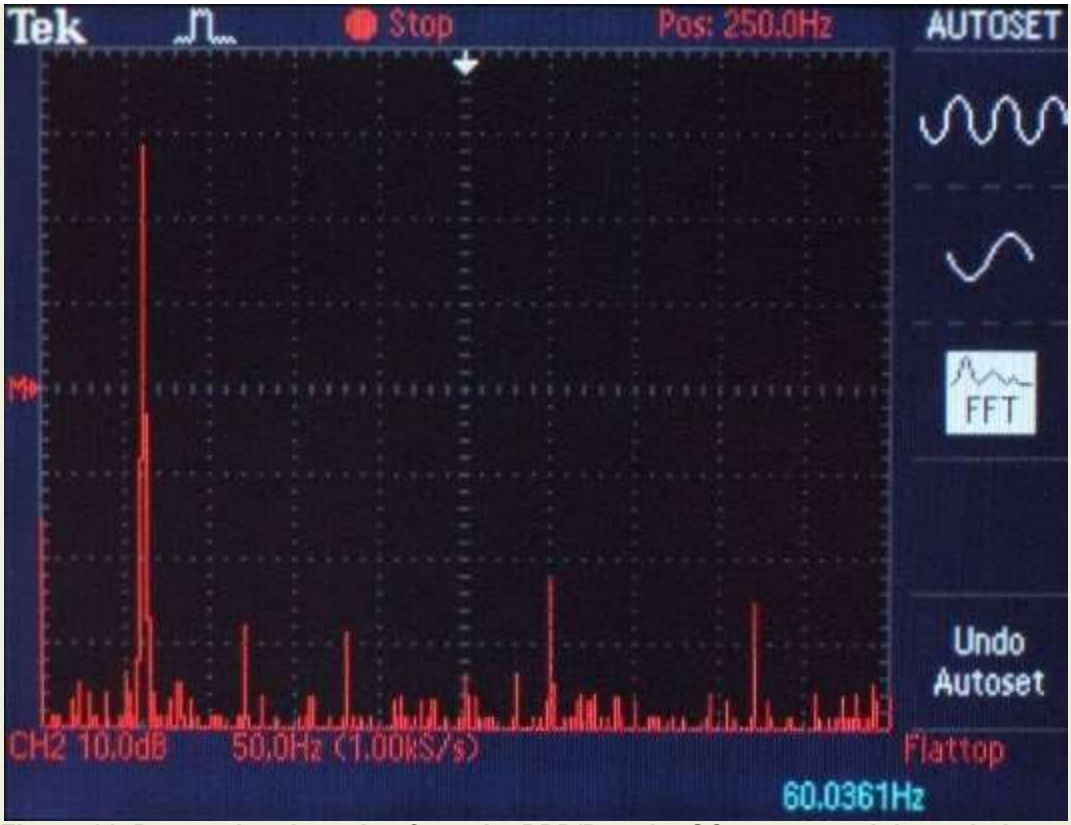


Figure 11. Power signal coming from the PPP/Premier SC power cord through the stock Littlefuse 313 fuse.

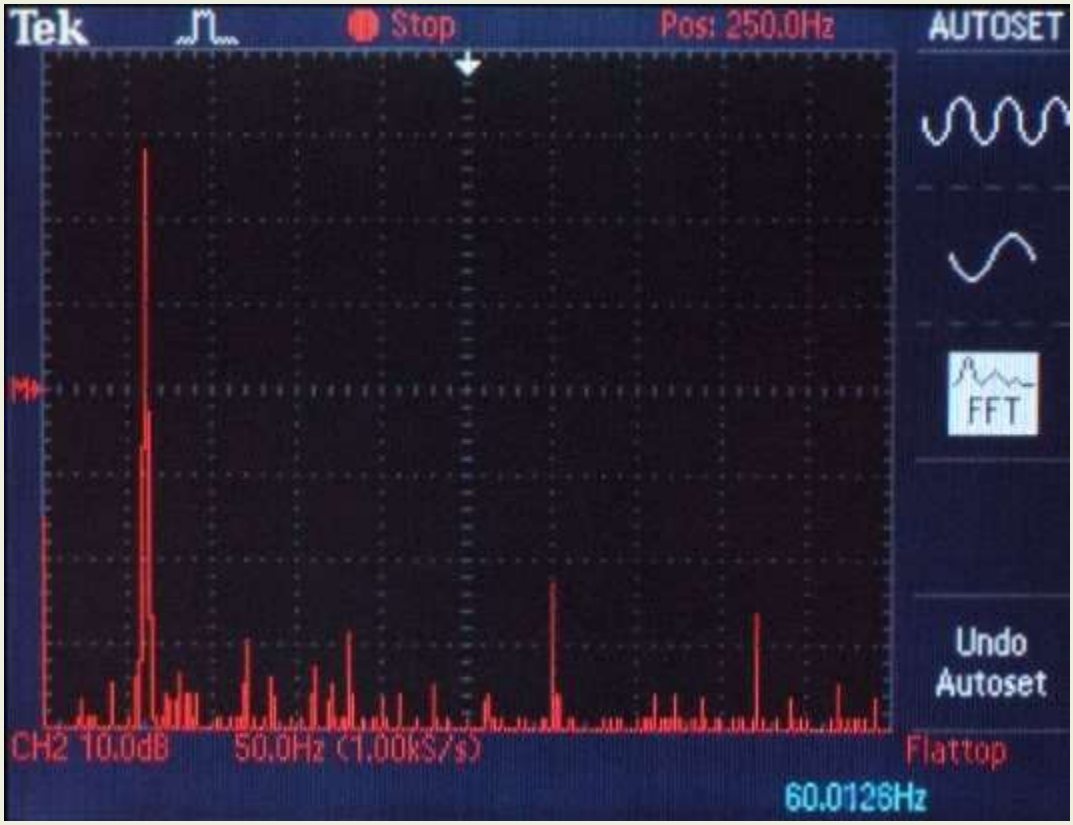


Figure 12. Power signal coming from the PPP/Premier SC power cord through the reversed HiFi Tuning fuse.

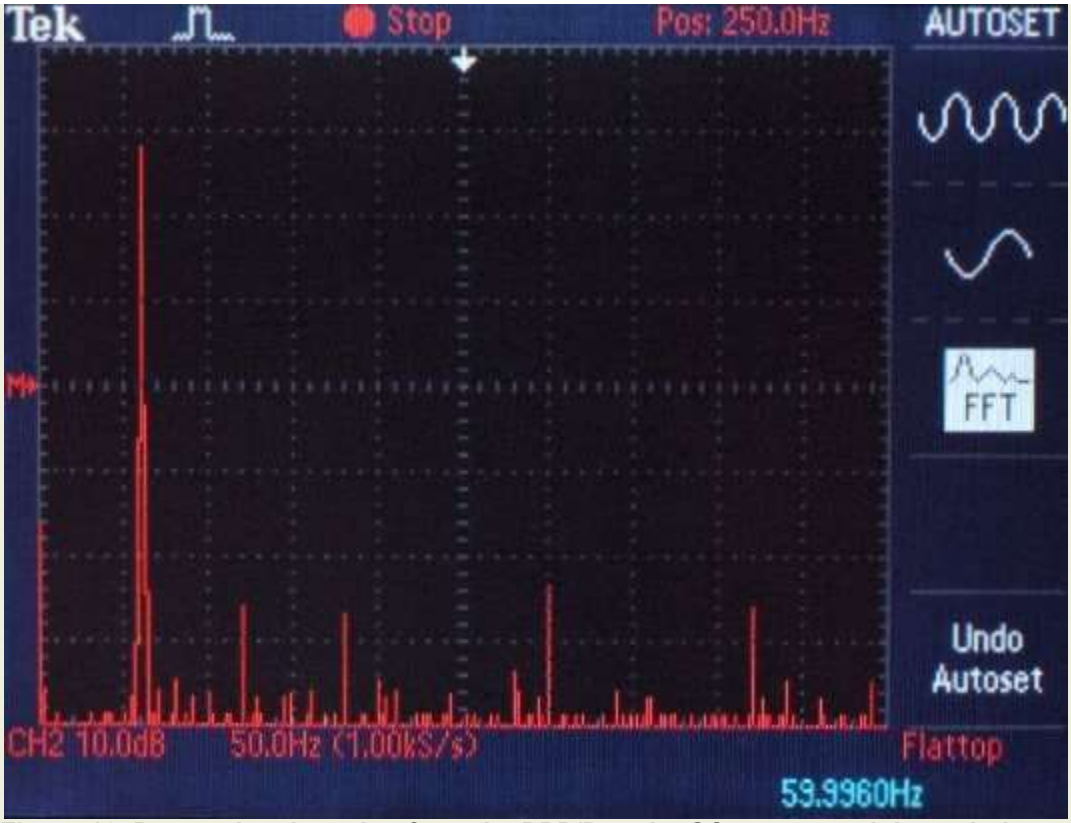


Figure 13. Power signal coming from the PPP/Premier SC power cord through the properly oriented HiFi Tuning fuse.

Figure 11 shows a significant increase in noise density around 60 Hz when the stock Littlefuse is in place. The noise scenario with the reversed HiFi Tuning fuse (figure 12) is a little better than that of the stock fuse. Comparing figures 10 and 13, we see that the noise with the properly oriented HiFi Tuning fuse is significantly reduced in overall amplitude and density. No wonder it made **Such Good Sound**!

Figure 14. HiFi Tuning fuses and packaging.

Figure 15. Isoclean fuses and packaging.

Conclusion

Gross noise spectrum measurements such as the ones shown in this report provide some insight, but they cannot tell the whole story with respect to a device's noise characteristics. To get the total noise picture we would also need to look at noise at the molecular and atomic levels. Fortunately, such levels of measurement detail are not required because we can simply use our ears to tell if there is an improvement.

Generally, the better the electrical noise characteristics of the device, the better the results that will be heard. Loudspeakers are typically the noisiest components in the audio chain with their aggregate of thermal, vibrational, flicker, and shot noise. They usually benefit less from audio grade fuses. Low noise preamp's typically benefit the most, with power amp's coming next. In my system, the phono preamp benefited the most, the line level preamp was a close second, and the power amps were a distant third.

Audio grade fuses, being the tiny little devices they are, are better applied **after** more stringent noise reduction techniques have been applied. I think of them as "icing" rather than the "cake", with the cake being active and passive power conditioning devices.

Further Study

Future plans include replacing the power supply fuses in my Cary SACD player and Teres Audio turntable motor power supply. I asked Chris Brady of Teres Audio if he had experimented with audio grade fuses in his turntable power supplies. He replied that this is on his long list of things to try and that he looks forward to reading my results.

Some high end speaker manufacturers, as well as DIY'ers, use Bybee filters at their driver and/or binding post inputs. In the not too distant future, when I'm feeling brave enough to do **further** modifications to my speakers, I'll evaluate some Bybee purifiers in that application.

The only brands of audio grade fuses that I know of are Isoclean, HiFi Tuning, Furutech and PS Audio (Critical Link brand). Isoclean and HiFi Tuning manufacture their own fuses. PS Audio's fuses are made by a German company called AHP. Furutech's fuses are made by a Swiss company whose name they don't care to divulge. There are

English language audio press and consumer reviews of the Isoclean and HiFi Tuning fuses. I did not find any audio press reviews of the Critical Link fuses, but there are some consumer reviews on various forums. The Furutech fuses have been reviewed by a couple of Japanese audio magazines and there are some consumer reviews on various forums. I'm sure that, in due time, someone will do a proper audio grade fuse "shootout" similar to the excellent audio grade capacitor shootouts we have enjoyed.

Associated Equipment

01. Pass Laboratories X0.2 Preamplifier
02. Pass Laboratories Xono Phono Preamplifier
03. Parasound Halo JC 1 Monoblock Amplifiers
04. Teres Audio Model 255 Turntable with Acid Etched Holographic Mylar Turntable Belt (DIY), Sonic Purity Concepts and Design Reflex Record Clamp, Graham Phantom B-44 Tonearm, Ortofon MC Windfeld Cartridge and Teres Audio Reference II Turntable Motor
05. Cary Audio CD 306 Professional Version SACD Player
06. Polk Audio SDA SRS 1.2TL Speakers (Hot Rodded)
07. Audioquest LeoPard Tonearm Cable
08. Audioquest Sky XLR Interconnects
09. Audioquest Everest Speaker Cables
10. Signal Cable MagicPower Cord for Turntable Power Supply
11. PS Audio Premier SC Power Cords For Amplifiers and SACD Player
12. PS Audio Statement SC Power Cord for Power Plant Premier
13. PS Audio Power Plant Premier Power AC Regenerator for Source Components
14. PS Audio Soloist Premier SE In-Wall Power Conditioners for Power Amplifiers
15. PS Audio Power Port Premier AC Receptacle for Source Component AC Circuit
16. Three Dedicated 20 Amp AC Circuits
17. Black Diamond Racing Mk4 Cones, Mk4 Mini Black Holes and Jumbo Pits Isolation Devices
18. Salamander Designs Synergy Triple 30 Audio Credenza

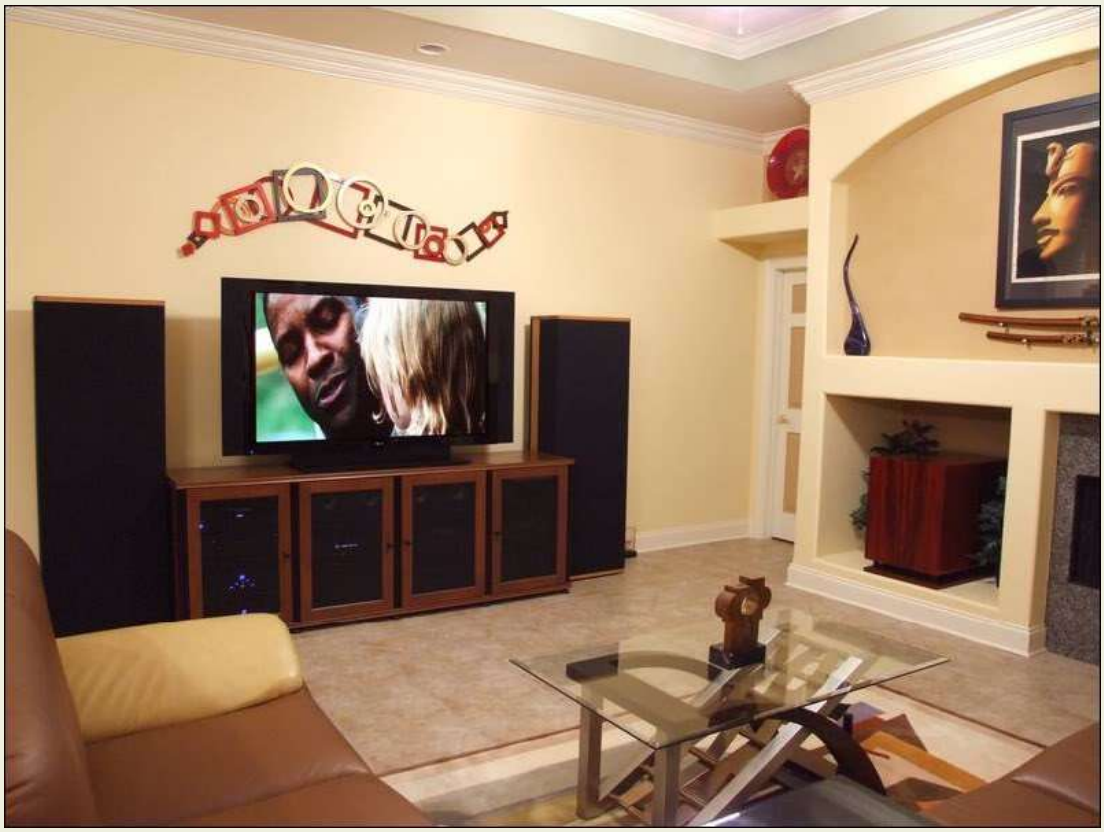
Part 8

1. Studies On Residential Power Line Noise - Part 8: Audio Grade Fuses For Home Theater

Prologue

"Submitted for your approval: A nascent videophile, stirred by the performance enhancements in his tricked out audio system, yearns for similar warm, fuzzy feelings from his lower resolution upper mid-fi home theater system. Such warm fuzziness can certainly be had...but only for a price. Next stop: The Blu-Ray zone."

Home Theater Noise Reduction Program



Denzel tries to hide his elation about the prospect of audio grade fuses coming to the SDA Shrine Theater.

So what do you do when you are getting 500% of your maximum daily requirement of audio thrills from your two channel system? Sit and listen? That would be too much like right wouldn't it? The correct answer is that you turn your

attention to tweaking home theater.:D

Out of curiosity, I installed audio grade fuses in the power amps, preamp, and subwoofer of my modest home theater system. These "fuses" are actually noise reduction devices in addition to being circuit protection devices. More technical details are here. The following noise reduction measures were already in place:

1. Two additional 20A AC circuits, terminated with PS Audio Power Port Premier AC receptacles.
2. Two PS Audio Power Plant Premier (PPP) AC regenerators. The Blu-Ray player, plasma television, preamp/processor, and center channel amp are on the first PPP and 20A AC circuit. The front speaker's amp and surround speaker's amp are on the second PPP and 20A AC circuit.
3. All stock power cords were replaced by Signal Cable MagicPower cords.
4. The subwoofer has its own 20A AC circuit, which is terminated with a PS Audio Soloist Premier SE in-wall passive power conditioner.

The additional power tweaks consisted of:

1. Replacement of the stock subwoofer power line fuse with an Isoclean audio grade fuse.

2. Replacement of the stock power amp power line fuses with Isoclean audio grade fuses. I did not want to spend the money to replace the four rail fuses in the three Adcom GFA-5500 power amps because this would have required twelve fuses at $45 each ($540) and the expected improvement, if any, was small. This was based on the small improvement provided by replacing the JC 1's rail fuses. Rather than replacing the power amp rail fuses, I would get more bang for the buck applying that money toward a higher performance Blu-ray player.

3. Replacement of the stock preamp/processor power line fuses with HiFi Tuning fuses. I would have preferred Isoclean fuses, but my Sony TA-E9000ES pre/pro requires a 5A fast blow fuse and a 3.15A slow blow fuse. Isoclean does not make fast blow fuses and they do not make a 3.15A slow blow fuse.

My three year old Hitachi plasma HDTV (720p) still holds its own against younger, newer, higher resolution displays. I may eventually upgrade to a 1080p display, but I have yet to see a 50 to 60 inch 1080p plasma display fed by Blu-ray sources that makes me dissatisfied with my current TV. Furthermore, my choices among current HDTV plasmas are limited because I prefer a model with a swivel stand and cable card slot. I don't like those aesthetically unappealing silver/gray cable boxes.

I will be upgrading my Blu-ray player in the near future, not because I am dissatisfied with the Sony BDP-S2000ES Blu-ray player, but rather because I want a Blu-ray player in my home office. The BDP-S2000ES is replacing the Sony DVP-S9000ES DVD player in my home office and something "more wonderful" will be replacing the BDP-S2000ES in my home theater...but that is a subject for a whole 'nother thread.

Music and Video Selections

I used the following scenes at the beginning of Star Wars Episode II for low frequency sound effects evaluation:

1. Senator Amidala's ship approaching Coruscant.
2. Senator Amidala's ship exploding on the landing platform.

For 360 degree sound field cohesiveness and detail evaluation:

1. Space battle scene at the beginning of Star Wars Episode III.
2. Battlefield scene at the beginning of Terminator 2: Judgment Day.

For movie dialog clarity and natural sound:

1. The conversation between James Bond (Daniel Craig) and Dryden at the beginning of Casino Royale.
2. Sarah Connor's monologue at the beginning of Terminator 2: Judgment Day.

For two channel music sound staging, clarity, and bass drive, bass articulation and bass detail:

Track 1-"Funkin' For Jamaica (NY)", Tom Browne, "Love Approach" CD.
Track 5-"Dianne's Blues", George Howard, "The Very Best of George Howard" CD.
Track 3-"Take Five", Dave Brubeck Quartet, "Time Out" CD.

Subwoofer Fuse Replacement

A civilized and refined bass beast is more so with a $35 fuse installed.

I was surprised when I heard the SVS PB12 Ultra/2's performance improvement with the Soloist SE ($250) over that provided by the Power Plant Premier AC regenerator ($2,200) [addendum to this review and post #4 of this review]. You just never know what will work.

Replacing the PB12 U/2's stock fuse with an Isoclean fuse enhanced bass articulation, added more definition to rumble, and added more bass weight and tactile sensation. The subwoofer also sounded slightly louder. I first listened to movies and CD's with the other speakers off, then with the sub blended in with the other speakers.

When the sub was blended in with the other speakers, images were a little heavier and dialog was a little clearer. During the scene in Chancellor Palpatine's office, near the beginning of Star Wars Episode II, The crisp edge of Palpatine's baritone voice was enhanced and, overall, his voice was a little heavier and clearer.

On music, the bass was a little faster and more defined.

Power Amp Fuse Replacements

The three Adcom GFA-5500 power amplifiers at the bottom of my audio credenza now have fuses with arrows on them, because fuses with arrows on them help make Such Good Sound.

The first thing I immediately noticed was all the subtle sounds from the front and surround speakers that I had never noticed before. Then I noticed that the sound stage for both music and movies was a little wider and deeper by 1 foot. Center images were a little heavier and more detailed. The throaty, rumbly growl of the Terminator's motorcycle in "Terminator 2" was heavier and apparently louder. The subtle "crunch" of the Terminator's leather jacket and pants was clearer and more defined as he got off his motorcycle and walked up to the club owner to swipe the shotgun out of his hand.

Preamp/Processor Fuse Replacements

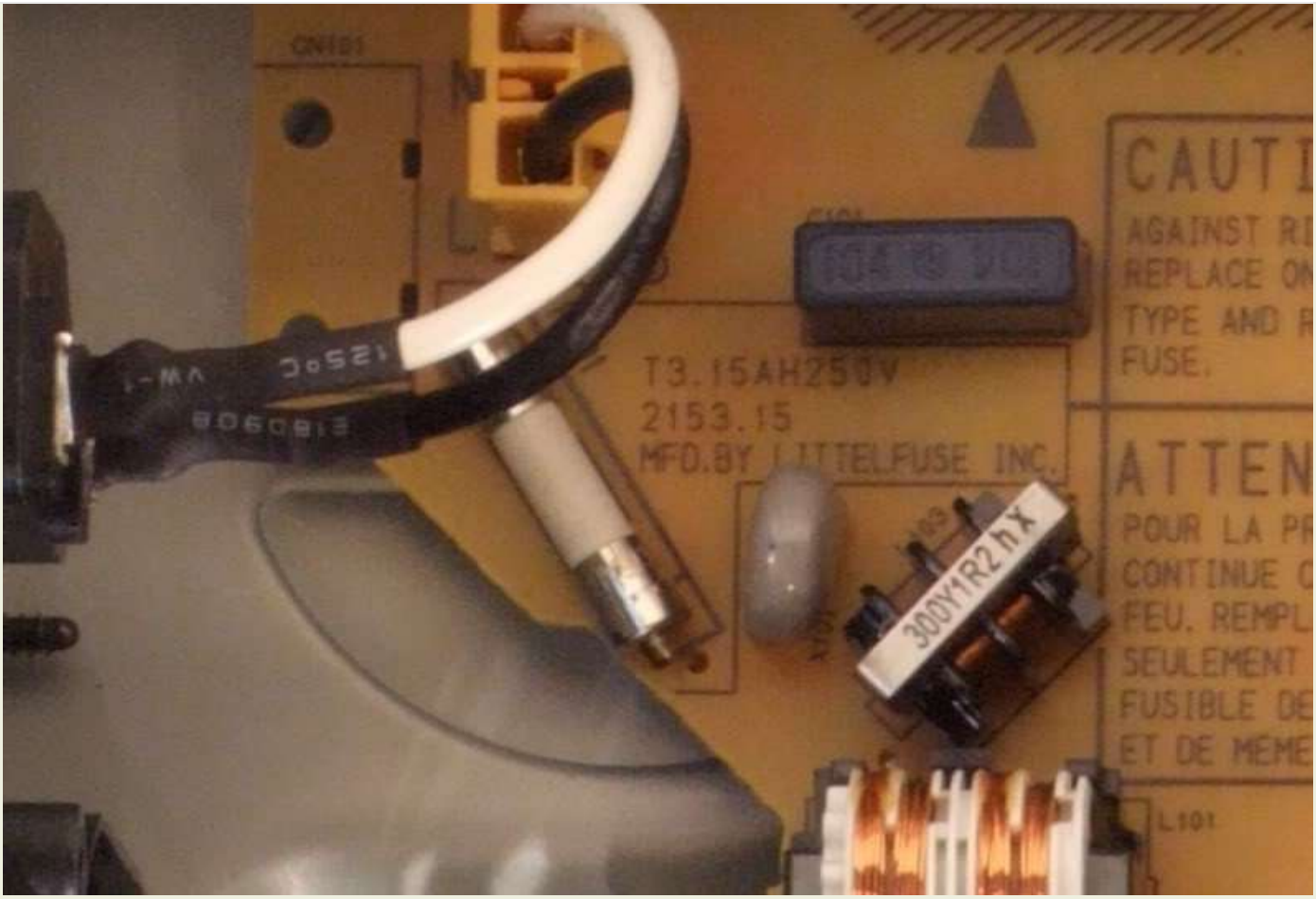
Replacing the fuses in the subwoofer and power amplifiers was an easy task which only involved accessing the ample space behind each unit. Those fuse replacements were completed in under five minutes each. Replacing the two fuses in the Sony TA-E9000ES was not fun because I had to disconnect all the inputs/outputs, pull the unit from its shelf, remove the case top, then remove a small circuit board above the rear of the power supply board. This took an hour...but it was worth it.:)

Replacing both of the preamp/processor's fuses resulted in a degree of improvement over that provided by the sub and power amp fuse changes. The sound stage grew by an additional two feet at the sides and front. There was an overall enhancement to three dimensionality and space between images within the sound stage. The enhanced detail and image weight from the front and surround speakers provided a more immersive and cohesive 360 degree listening experience.

Some background sounds that were previously confined to the plane of the TV and speakers were now projected one or two feet forward. For example, the "whooshing" sound that Senataor Amidala's ship makes as it is about to land was louder and projected 1 foot in front of, and near the top of, the right speaker. Previously, that sound was confined to the space just in front of the right speaker and was nearly lost in all the other background sounds.

1. Studies On Residential Power Line Noise - Part 8: Continued

Blu-ray Player Fuse Replacement



Sony BDP-S2000ES power line fuse.

The Sony BDP-S2000ES uses an axial lead sand-filled ceramic body power line fuse that is soldered to the power circuit board. Certainly, back and forth comparisons of the stock and replacement fuse would have been tedious and aggravating. Because of this, and because this player is slated to be moved to my home office when it is replaced by the upgrade Blu-ray player, I decided to skip replacement of this fuse. If the upgrade Blu-ray player uses a standard type fuse holder, I will definitely evaluate it with and without an audio grade fuse.

Additional Power Line Conditioning

I considered replacing the two Power Port Premier receptacles (located behind the HT equipment credenza) with Soloist Premier SE in-wall power conditioners, but I was quite satisfied with the audio resolution improvements provided by the fuse upgrades. The Soloists would have cost an additional $500 and I preferred to put that toward a Blu-ray player upgrade. Curtailing my lust for higher resolution and forgoing the power amp rail fuse upgrade and Soloists saved me $1,040...for now.

No Love For Meter Pontiffs

No 'scope traces or other quantitative measurements this time. You'll just have to take my ears' word for it...or better yet, run your own noise study and take your own measurements.:)

Conclusion

The highest degree of improvement was provided by the preamp/processor fuse replacement, followed by the power amp fuse replacement, followed by the subwoofer fuse replacement. In each case, the improvements were immediately evident after the fuse upgrade. Further investments in lower noise interconnects, lower noise power cables, power amp rail fuses, and additional in-wall power conditioners, would probably yield yet more resolution enhancements, but I'll (try to) wait until the next house and it's dedicated theater room for all that.

Epilogue

"So there you have it. In the ordinary world, fuses are just protection devices and AC receptacles just provide 120V@60Hz. But in this dimension of sight and sound, fuses are directional and they, along with high end AC receptacles, passive in-wall power conditioners, AC regenerators and well shielded, heavy gauge power cords, suck copious amounts of electrical noise from power signals. It's all for the burgeoning videophile's aural and visual pleasure...in the Blue-Ray zone."

Associated Equipment

■Hitachi 55HDT52 Plasma HDTV (720p)
■Sony DVP-S9000ES DVD/SACD/CD Player
■Sony BDP-S2000ES Blu-Ray Disc Player, Ver. 4.30 Firmware
■Sony TA-E9000ES Digital Preamp/Processor Ver. 2.1 Firmware
■Three Adcom GFA-5500 Power Amps (350 wpc into 4 ohms) for Front, Center, and Surround Speakers
■Dual Polk Audio LSi9 Center Channel Speakers
■Polk Audio LSi15 Surround Speakers
■SVS PB12 Ultra/2 Subwoofer with 1000 Watt Bash Amplifier
■Monster M1000CV Component Video Cable
■Acoustic Research Coax Cables (DVD, CD)
■Monster Z2 Reference Speaker Cables
■Monster Z100i Interconnects
■Signal Cable MagicPower Cords
■Monster UL/CL3 In-Wall 12 Gauge Speaker Cable for Subwoofer
■Salamander Synergy Quad 30 Audio Credenza
■Acoustic Research HDMI cable
■Two PS Audio Power Plant Premier Power Regenerators
■PS Audio Power Port Premier 20 Amp AC Receptacles for Power Plant Premiers
■Two Dedicated 20 Amp AC Circuits For Amps, TV, and Source Components
■Separate Dedicated 20 Amp AC Circuit for Subwoofer
■PS Audio Soloist Premier SE Power Conditioner For Subwoofer

1. Studies On Residential Power Line Noise - Part 9 - PS Audio P5 AC Regenerator

Introduction

The PS Audio Power Plant Premier (PPP) AC regenerator in my two channel system was replaced with a PS Audio PerfectWave P5 AC regenerator. Like many PPP owners, I was on the fence about "upgrading" from the PPP to the P5 because I wasn't sure the benefit, if any, would justify the expense. The P5 retails for $1305 more than the PPP ($3000 vs. $1695) and there are only minor differences in most of their performance specifications. Plus, the P5 has

two less outlets than the PPP and the P5's continuous output power is 1/3 less than the PPP. It would seem like you are paying more for less. However, the P5 offers important upgrades in energy storage and energy delivery over the PPP which translate to a much better stereophonic presentation. After the first day, I could hear that the cost premium was justified. There was significant improvement in stereophonic performance parameters: more image weight, more depth, more bass weight and articulation and more fine detail.

Table 1. PPP-P5 Performance Specification Differences

	Power Plant Premier	PerfectWave P5
Maximum Continuous Output	1500 Watts	1000 Watts
Typical Output Total Harmonic Distortion	0.4%	0.2%
Number of Outlets	10	8
Energy Dissipation	2160 Joules	2440 Joules
Output Impedance	Less Than 0.05 Ohm (3 Times Less Than The Wall)	Less Than 0.0015 Ohm (100 Times Less Than The Wall)
Weight	33.4 Pounds	39 Pounds
Dimensions	17" W x 16.5" D x 4" H	17" W x 14" D x 4" H

The significantly lowered output impedance is important because it directly affects transient performance. Music signals have many peak power demands (transients) that last for only a small fraction of a second. The ability to cleanly and accurately reproduce such transients, particularly low frequency transients, contributes to the realism of sterophonic music reproduction.

Figure 1. The P5 is shipped double-boxed. The inner box contains an upper and lower corrugated cardboard frame that surrounds and suspends the P5 in a tough plastic bubble.

Figure 2. Sleek and elegant! The fit and finish of the P5 was excellent.

The PPP's case rang like a church bell. The P5's case is much better damped. Knocking on the P5's case in every location except for the upper side panels produced a solid dull thud. Knocking on the upper side panels produced a hollow sound.

Figure 3. P5 Rear. I didn't like the sideways turned outlets. Having to reach behind the unit and twist the connectors of thick, stiff (1" diameter) power cables sideways was not fun.

The P5's user interfaces are the remote control, the front panel touch-screen and the online GlobalNet interface. The touch-screen provides a variety of menus for status reporting and control. I like the oscilloscope function that shows the input waveform, output waveform and the noise difference between the two.

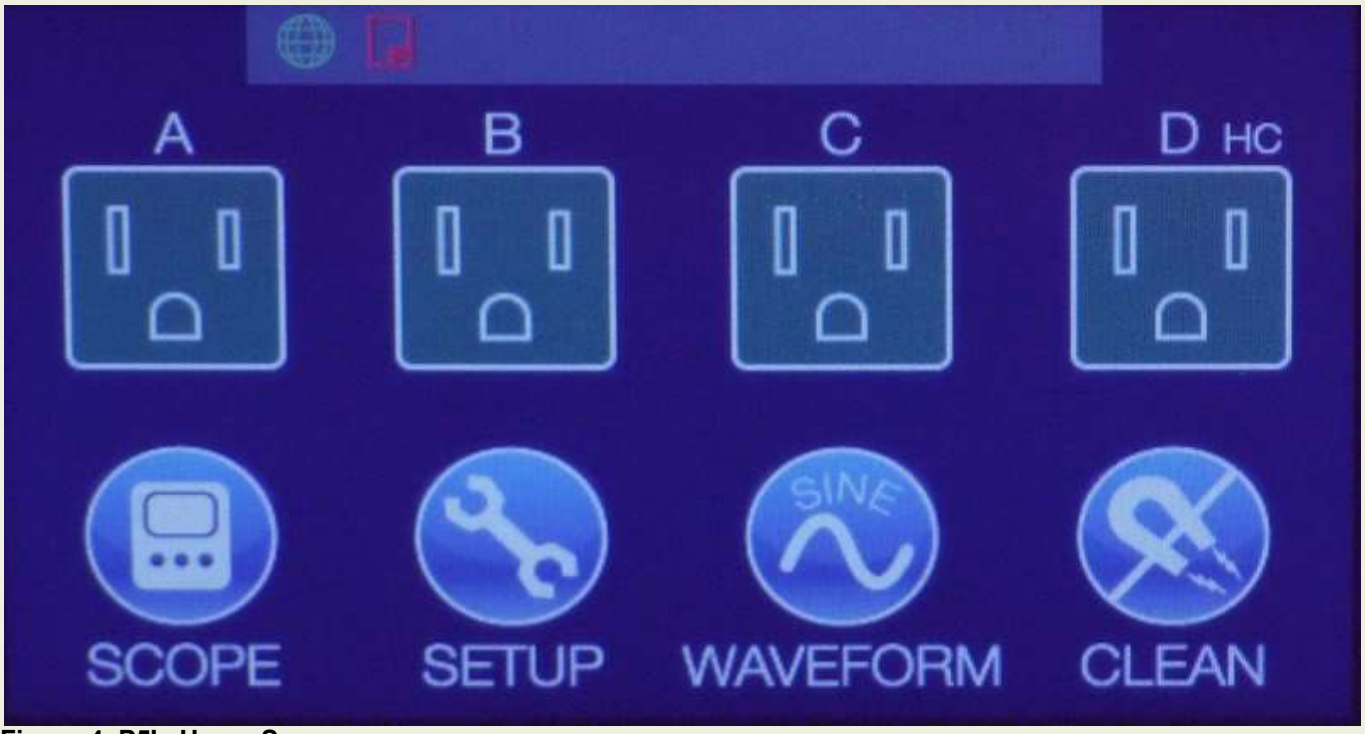


Figure 4. P5's Home Screen.

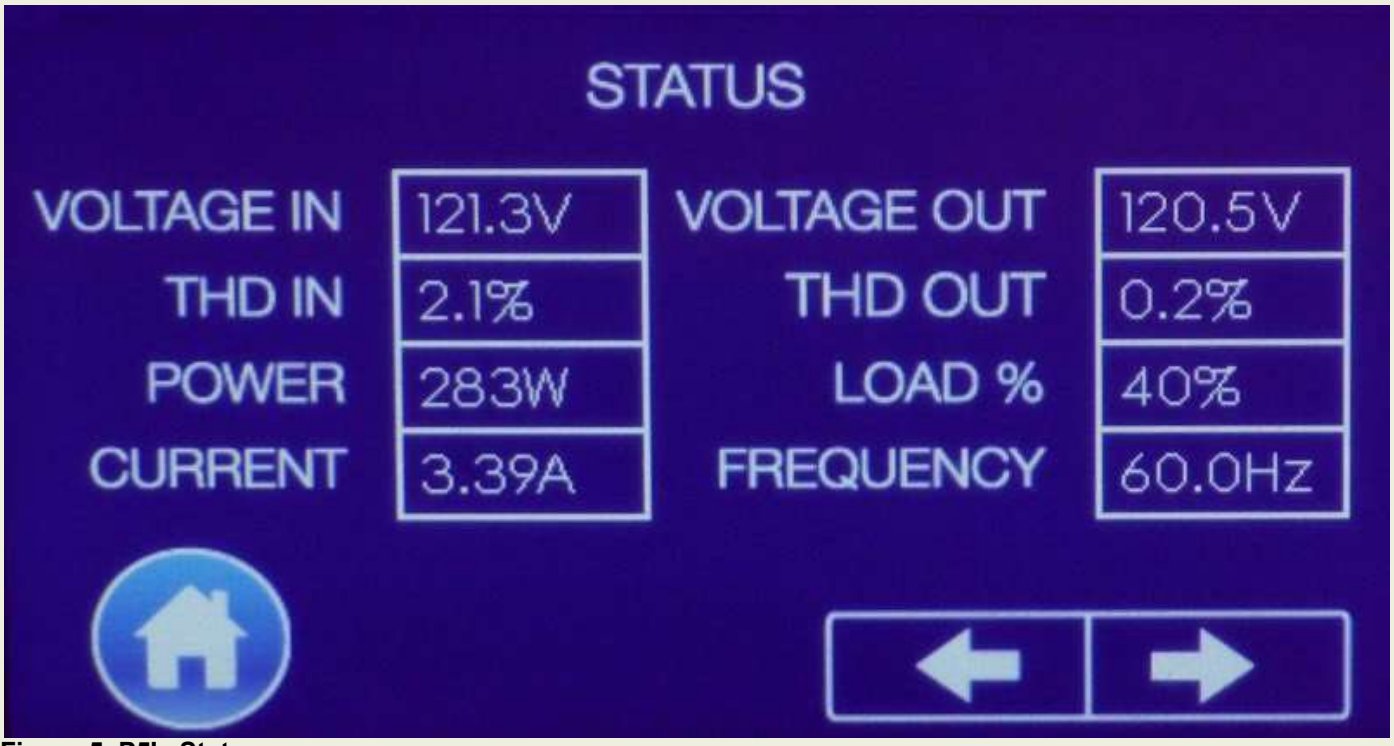


Figure 5. P5's Status screen.

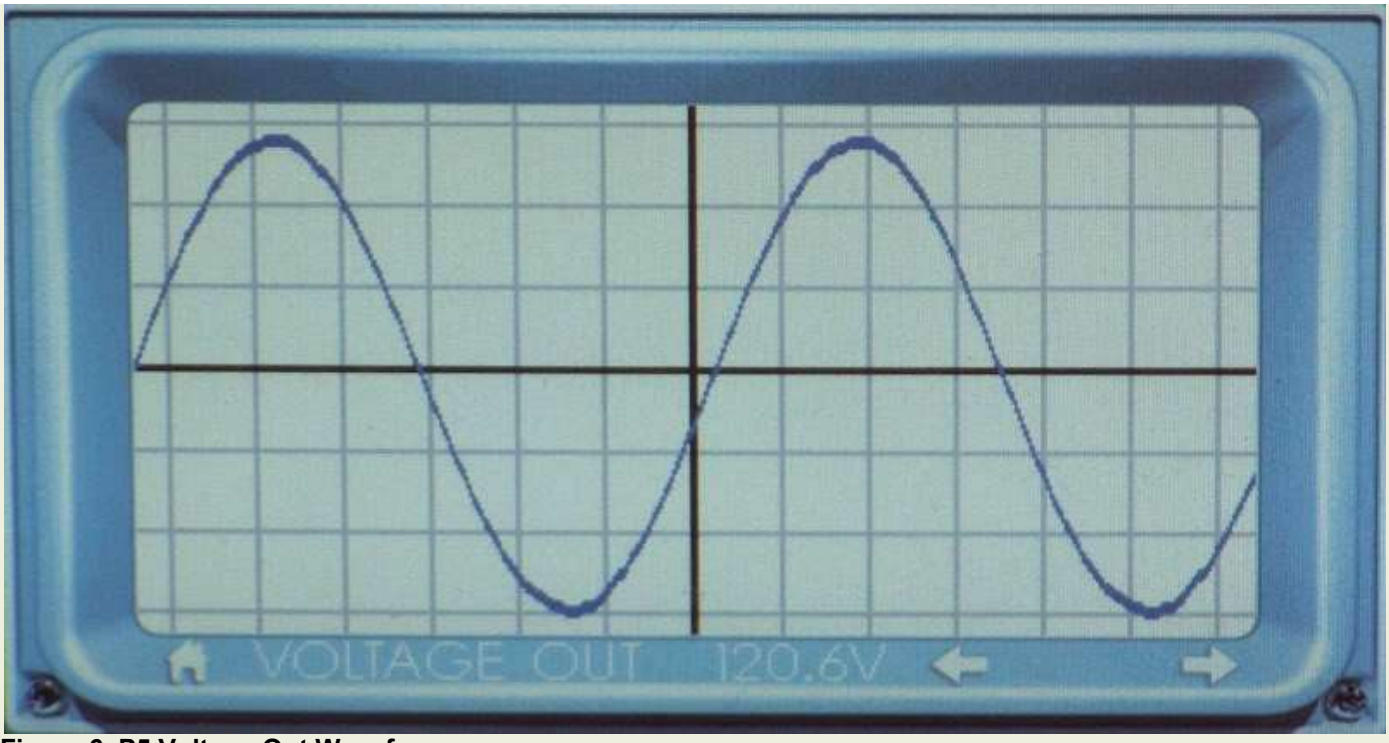


Figure 6. P5 Voltage Out Waveform screen.

There were two errors in the P5 manual (which must be downloaded from the PS Audio website):

Page 7: "Naming output receptacle #1, Zone A: By selecting the green "setup" button next to that zone, the screen will change to a keyboard interface upon which letters and numbers can be touched to name that zone. Generally, users of the Power Plant 5 will name said output receptacle by that which is connected. For example "DAC" or "Power Amp" or "Turntable"."

CORRECTION: Output receptacles can only be named through the online GlobalNet interface. PS Audio said the keyboard interface will be activated in a future firmware update.

Page 10: "After its activation, but before the P5 fully initializes and enters the HOME SCREEN, the unit?s front-panel touch-screen can be touched **anywhere** on its face. This will bring the user to the SYSTEM SETUP SCREEN where the following parameters are displayed:

1. Unit ID
2. Bootloader
3. Firmware
4. Power Meter
5. Oscillator
6. Web
7. Dimmer"

CORRECTION: The System Setup Screen can only be accessed by touching the PS Audio logo in the center of the touch-screen as the P5 is initializing.

Figure 7. P5 and the PPP it replaced.

My initial plan was to move the PPP to my test rig. Apparently, the PPP did not appreciate being demoted to test rig duty. Immediately after turning on the PPP in its new location, it went into protection mode (as evidenced by a slow clicking sound). I rebooted the PPP and it went right back into protection mode. It was sent back to PS Audio for repair, which they did free of charge even though the unit was out of warranty. I had not had any trouble with it during the over three years it had been in my two channel system.

Three of the four PPP's I own have had to go back to PS Audio for repair. In each case there was a component failure in the regenerator circuit.

Figure 8. P5 installation in two channel equipment cabinet.

Figure 9. P5 installation in two channel equipment cabinet.

Online GlobalNet Interface

After a P5 is registered on the PS Audio website, the owner is able to monitor status and control certain functions through a web page interface. Individual power zones, as well as the entire unit, can be turned on and off remotely over the web interface. I (and other P5 owners) questioned the frequent voltage surges that appeared in the output voltage measurements. PS Audio confirmed that the voltage spikes shown in figure 10 are due to a bug in the P5's firmware. A firmware update to correct the bug is in progress.

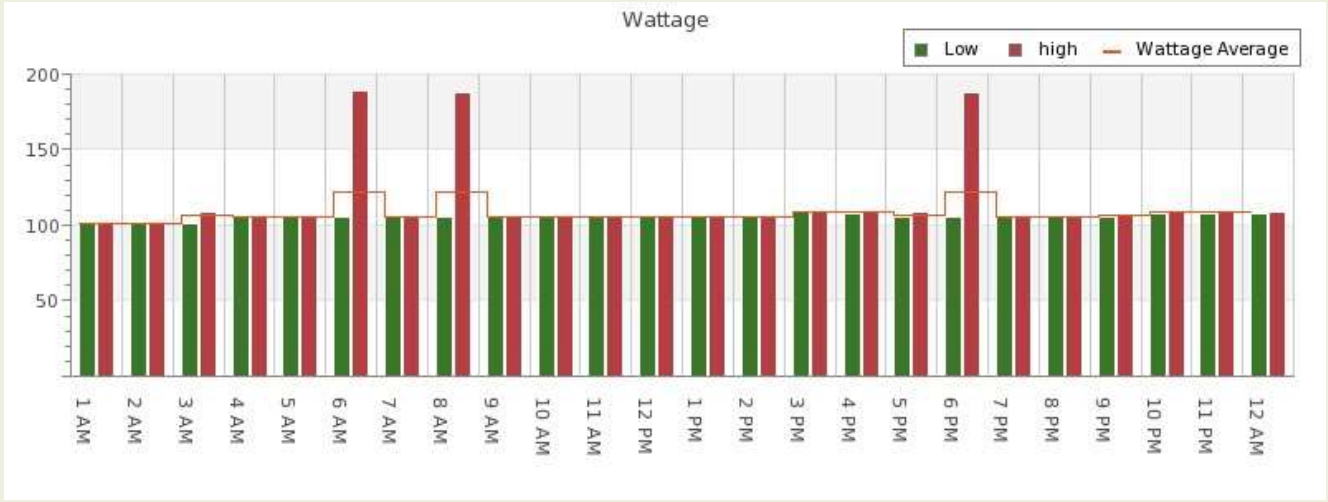


Figure 10. P5 voltage vs. time report from web interface.

1. Subjective and Quantitative Discussion

Break In Procedure

At the time of this review, my two channel system consisted of:

Pass Labs X0.2 Line Level Preamp,
Pass Labs Xono Phono Preamp,
Cary Audio CD 306 Pro SACD Player,
Teres Audio Model 255 Turntable,
Graham Phantom B44 Tonearm,
Ortofon MC Windfeld Phono Cartridge,
Parasound Halo JC 1 Monoblock Power Amps,
Polk Audio SDA SRS 1.2TL speakers (4 Ohms Nominal Impedance, Highly Modified),
AudioQuest Sky XLR Interconnects,
AudioQuest Everest Speaker Cables,
AudioQuest LeoPard Tonearm Cable,
Salamander Synergy Triple 30 Audio Cabinet,
PS Audio AC-12 Power Amp and P5 Power Cables,
PS Audio Premier SC Source Component Power Cables.

The JC 1's are on separate dedicated 20 amp AC circuits terminated with PS Audio Soloist Premier SE in-wall conditioners. The P5 is also on its own dedicated 20 amp circuit terminated with a PS Audio Soloist Premier SE.

Only the preamps and source components are connected to the P5. The P5 cannot handle the current demands of even one JC 1 power amp. Plugging in the right side JC 1 caused the sound stage to collapse with a loss of speed, detail and articulation in the bass. Plugging in the left side JC 1 caused the P5 to go into protection mode and shut down.

I let the P5 warm up for 24 hours prior to installation. During warm-up time, I checked all functions and measured the input and output voltages with an oscilloscope and a multimeter.

The sonic improvements with the Power Plant Premier were evident immediately after installation. In contrast, the initial sound of the P5 was ugly and veiled. Sound stage width shrank to the vertical midpoint of each speaker. The rhythm and pace of music was slower. Bass was less defined and less articulate ("wooly" but not "muddy"). After five hours, the P5 "loosened up" and the sound became the equal of the PPP. After eight hours, I began hearing more image weight and ambient information compared to the PPP. There was also more depth and image definition, especially on orchestral recordings.

After an additional 30 hours under load, I began hearing more bass slam, bass articulation and more overall detail.

The two channel system's preamps and source components only offered a 14% load to the P5 (1.2 Amps, 108 watts). I ran the P5 at 14% load for the first 39 hours. For a more thorough and efficient break in process, I added secondary components to increase the reactive load as follows:

Yamaha C-80 Preamp
Sony ST-S730ES Tuner
Adcom GFA-5500 Power Amp
Polk Audio CRS+ Speakers (4 Ohms Nominal Impedance, Highly Modified)

The additional components increased the load to 41% (3.46 Amps, 289 watts). After 95 hours at 41% load, I added a second Adcom GFA-5500 Power Amp, which was left idling. This increased the load to 60% (4.95 Amps, 400 watts). During normal listening hours I would listen to music through the two channel system. Overnight and while at work, I let the tuner play through the secondary system.

I use a home made simple test and conditioning rig for power cables and AC receptacles (the Juice Cyclone). It consists of a long board with three incandescent light bulb receptacles connected in parallel. The receptacles are independently switched. More details on the Juice Cyclone can be found here: JuiceCyclone Power Cable Conditioner

Connecting the Juice Cyclone to the P5 with two 200 watt bulbs increased the load to 89% (7.5 Amps, 788 watts). This was with all audio components idling. If I played music, the load increased to 90% and the yellow (not orange as the manual states) warning symbol came on at the top of the Home Screen. Adding an additional 100 watt bulb increased the load to 98% (8.21 Amps, 888 watts).

I was impressed with the stability of the P5's power quality and with the stability of sound quality as the load increased. I heard no change in sound quality among the 14%, 40%, 60% and 90% load conditions. This was while the speakers

were outputting an average 90 dB-C for hours. After 1 hour at 98%, I heard an overall loss of detail and smearing of bass. Reducing the load to 90% immediately returned the sound to normal.

The output total harmonic distortion was stable, between 0.2% and 0.3% as the load ranged from 14% to 98%. Most of the time it was 0.2%, even under the 98% load condition.

The P5 displayed excellent thermal stability. At a load of 40% or below, the P5 ran cooler than my Pass Labs X0.2 line level preamp. After 2 hours at 40% load playing music at an average 90 dB-C, the case top temperature of the X0.2 preamp was 92.7 degrees F. The P5's temperature (measured with a digital thermometer laid on the amplifier circuit vents) was 88.7 degrees F. After 4 hours at 60% load, the P5's temperature was 94 degrees F. After 12 hours at 90% load, the temperature was 102 degrees F. After 1 hour at 98% load, the temperature was 105 degrees F.

The fan is whisper quiet. Even from 6" away I only heard a faint hum rather than the familiar "whoosh". I could not hear the fan from 3 feet away.

The sonic changes throughout the burn in process are summarized in table 2.

Table 2. P5 Sonic Changes Throughout Burn In.

Hours	Cumulative Hours	Load Condition	Sound Quality
24	24	Idling at no load	
8	32	14% load	Veiled, constricted, wooly bass, slow rhythm and pace
15	47	14% load	Normal sound with more weight, detail, depth and bass s
16	63	14% load	More image weight, more detail at sound stage sides
95	158	40% load	More detail and clarity with fuse change at 125 hours
12	170	60% load	More clarity, weight and apparent sound level
12	182	90-98% load	More ambient details, especially at sound stage sides
68	250	60% load	No change
24	274	89% load	No change
48	322	60% load	No change
2	324	14% load	No change
Total 324	Total 324		

Summary of Audible Improvements [Note: I listen mostly to instrumental jazz recordings.]

1. The P5 is as big a difference in sound quality over the PPP as the PPP was over the wall.

2. Sound stage depth increased, but not width.

3. More image weight and clarity, especially at the sound stage sides.

4. Much higher quality bass reproduction: more slam, detail, clarity, articulation and speed.

5. More of a sense of holographic 3-dimensionality.

6. More fluidity in mid-range and high frequencies.

7. More fine details, particularly ambient noises reflected from the recording space walls.

8. More tactile sensation against my body and more bass vibrations coming through the floor, armrests and seat.

Fuse Replacement

The P5 uses a small size (5mm x 20mm) 5 amp slow blow fuse. After 125 hours, I replaced the P5's fuse with a HiFi Tuning Supreme fuse and I heard more fine details such as singer breathing noises, reed and mouthpiece noises, ambient room reflections and piano and bass note overtones and decay.

Under no load conditions, the output total harmonic distortion went from a steady 0.2% to fluctuating between 0.1% and 0.2% after the Supreme fuse was installed.

Curiously, the P5's fuse sounded best when oriented in the "wrong" direction (fuse arrow pointing against the direction of current flow). Other P5 and P10 owners have had the same results.

Measurements

AC waveform and noise spectrum (Fast Fourier Transform) measurements were taken with a Tektronix 2012 digital oscilloscope after the 324 hour burn in process. The P5 plots in figures 13 and 16 are with a HiFi Tuning Supreme fuse installed. The time domain (sine wave) plots of the PPP and P5 are identical. It is easier to see the difference between the regenerator and wall sine waves and the differences between the regenerator and wall FFT plots if the plots are downloaded and viewed in succession.

The noise amplitude and density in the outputs of both regenerators was significantly less than the wall. The P5 demonstrated a moderate reduction in noise amplitude and density compared to the PPP. The P5's output also had less DC content (2 dB less).

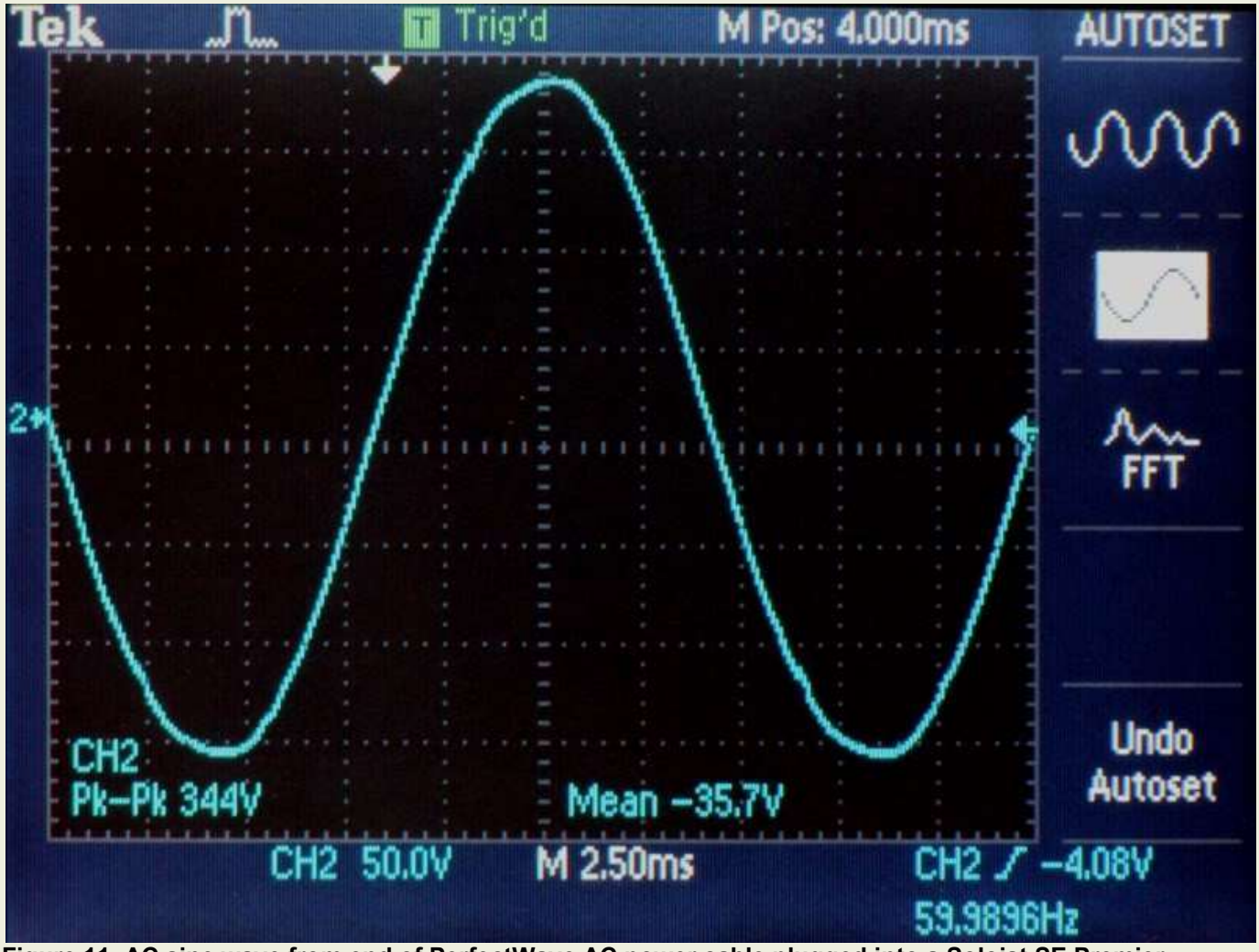


Figure 11. AC sine wave from end of PerfectWave AC power cable plugged into a Soloist SE Premier in-wall conditioner on a dedicated 20 amp AC circuit.

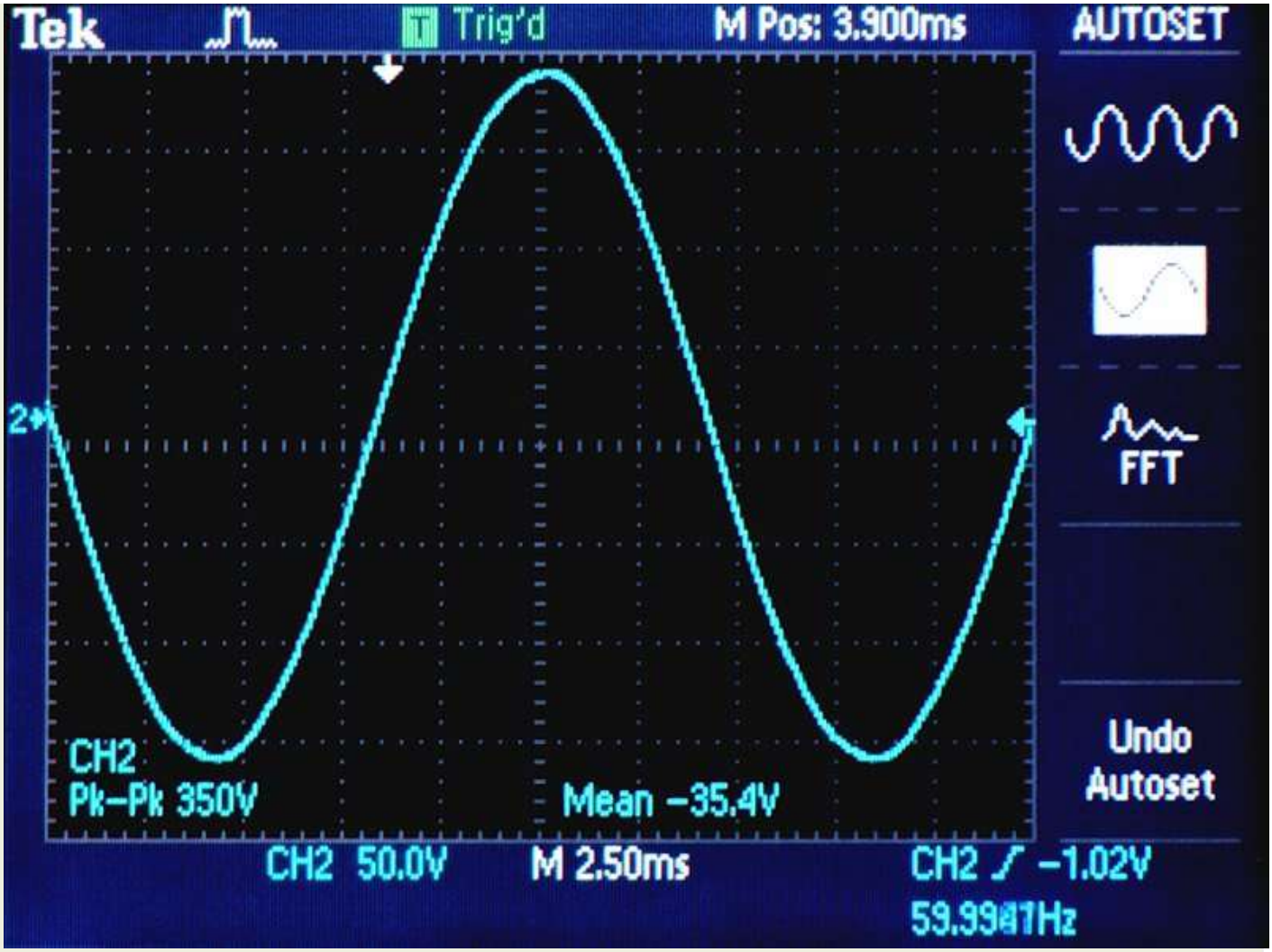


Figure 12. AC sine wave from output of Power Plant Premier.

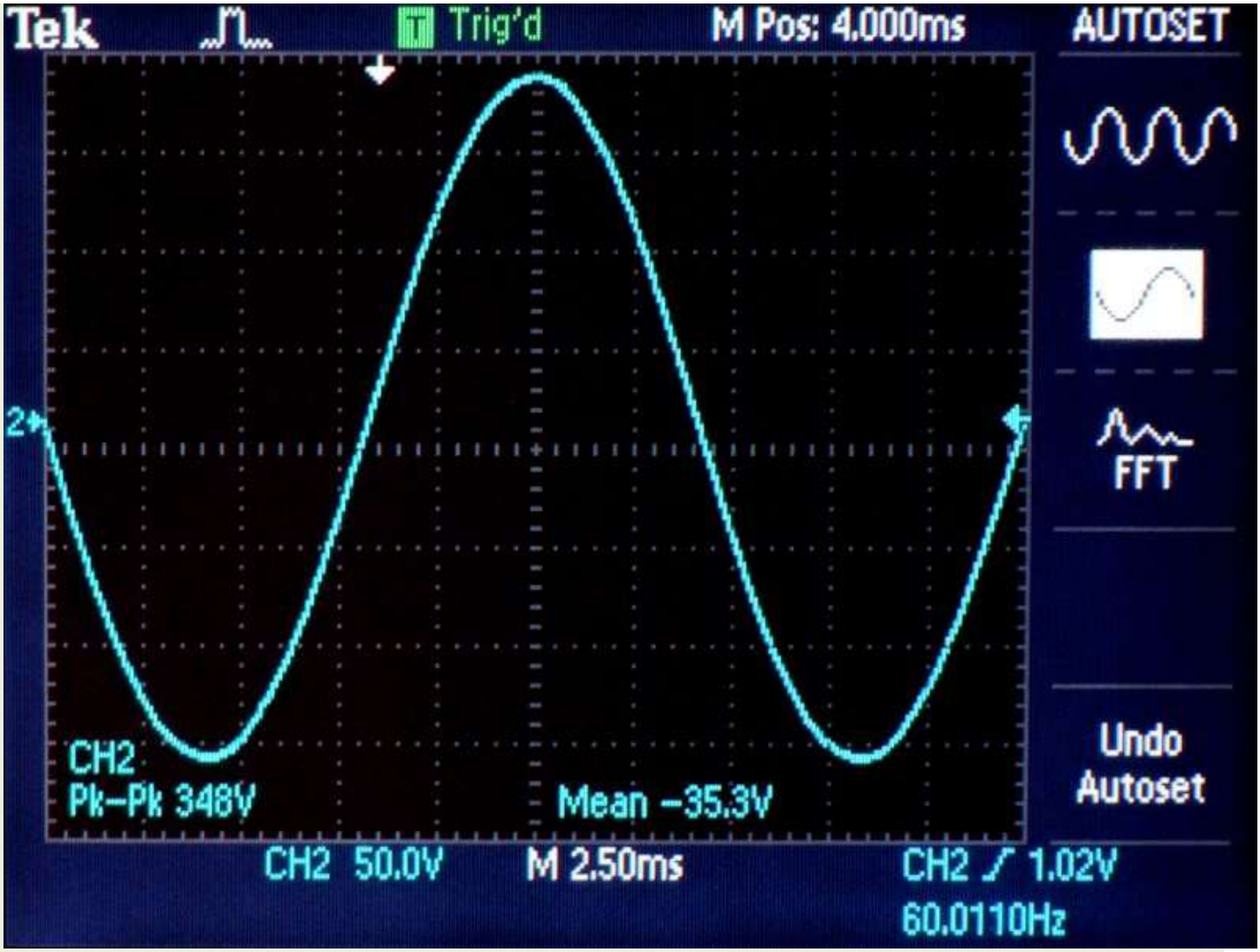


Figure 13. AC sine wave from P5.

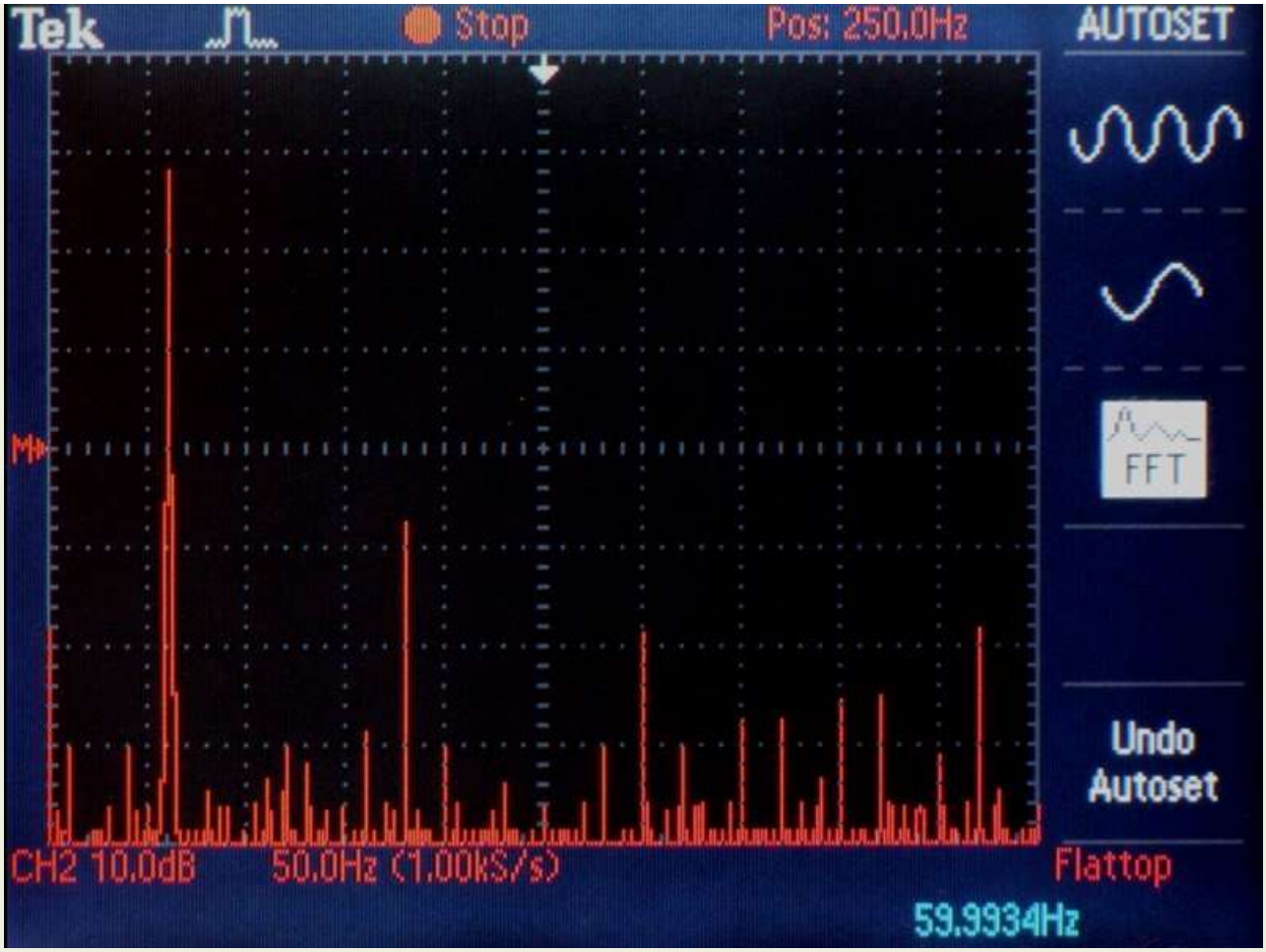


Figure 14. FFT plot from end of PerfectWave AC power cable plugged into a Soloist SE Premier in-wall conditioner on a dedicated 20 amp AC circuit.

Figure 15. FFT plot from output of Power Plant Premier.

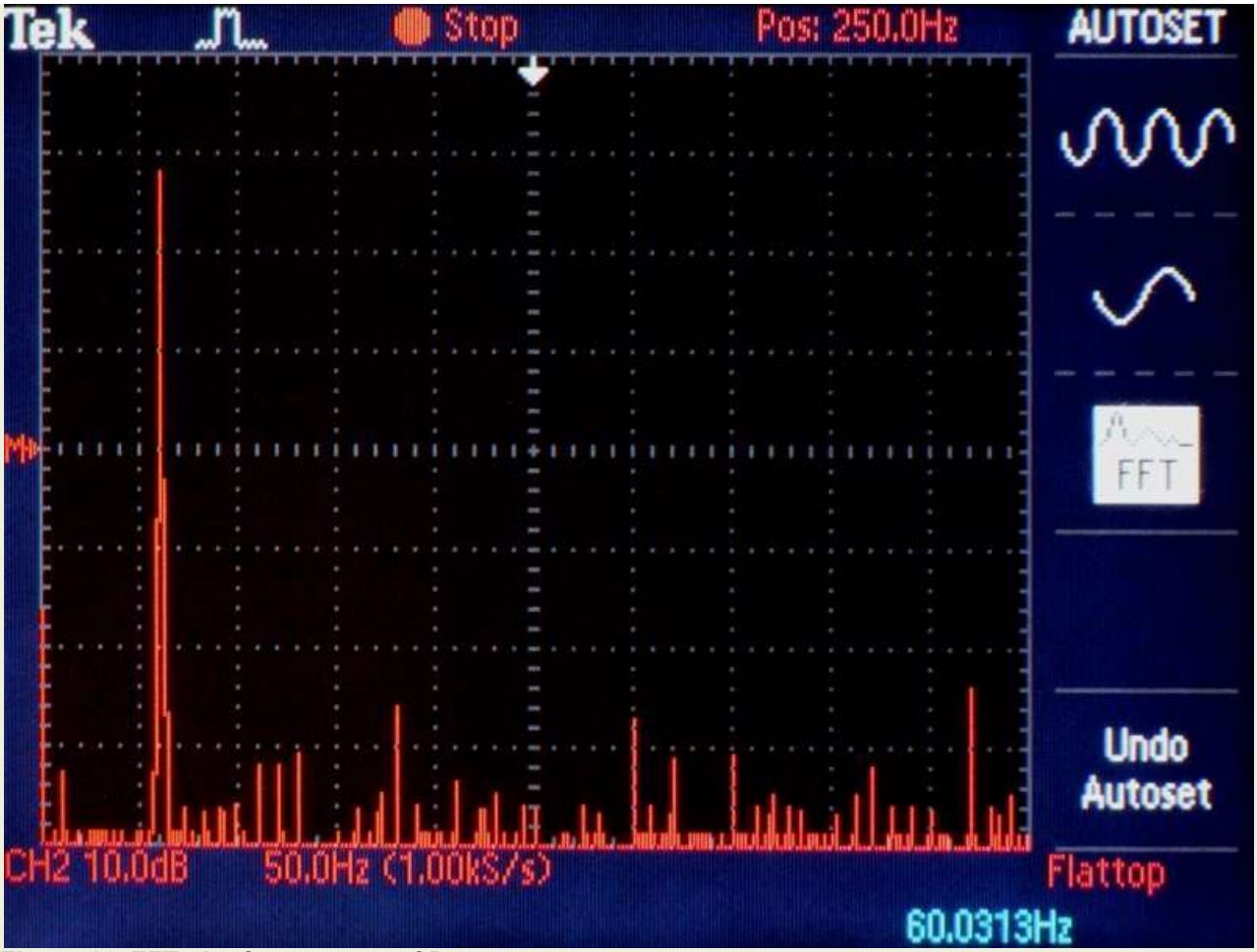


Figure 16. FFT plot from output of P5.

The next two plots show the difference in P5 output noise spectrum with the stock and HiFi Tuning Fuses installed. There was a moderate reduction in noise amplitude and density with the HiFi Tuning fuse. The DC content in the output also dropped by 2 dB with the HiFi tuning fuse.

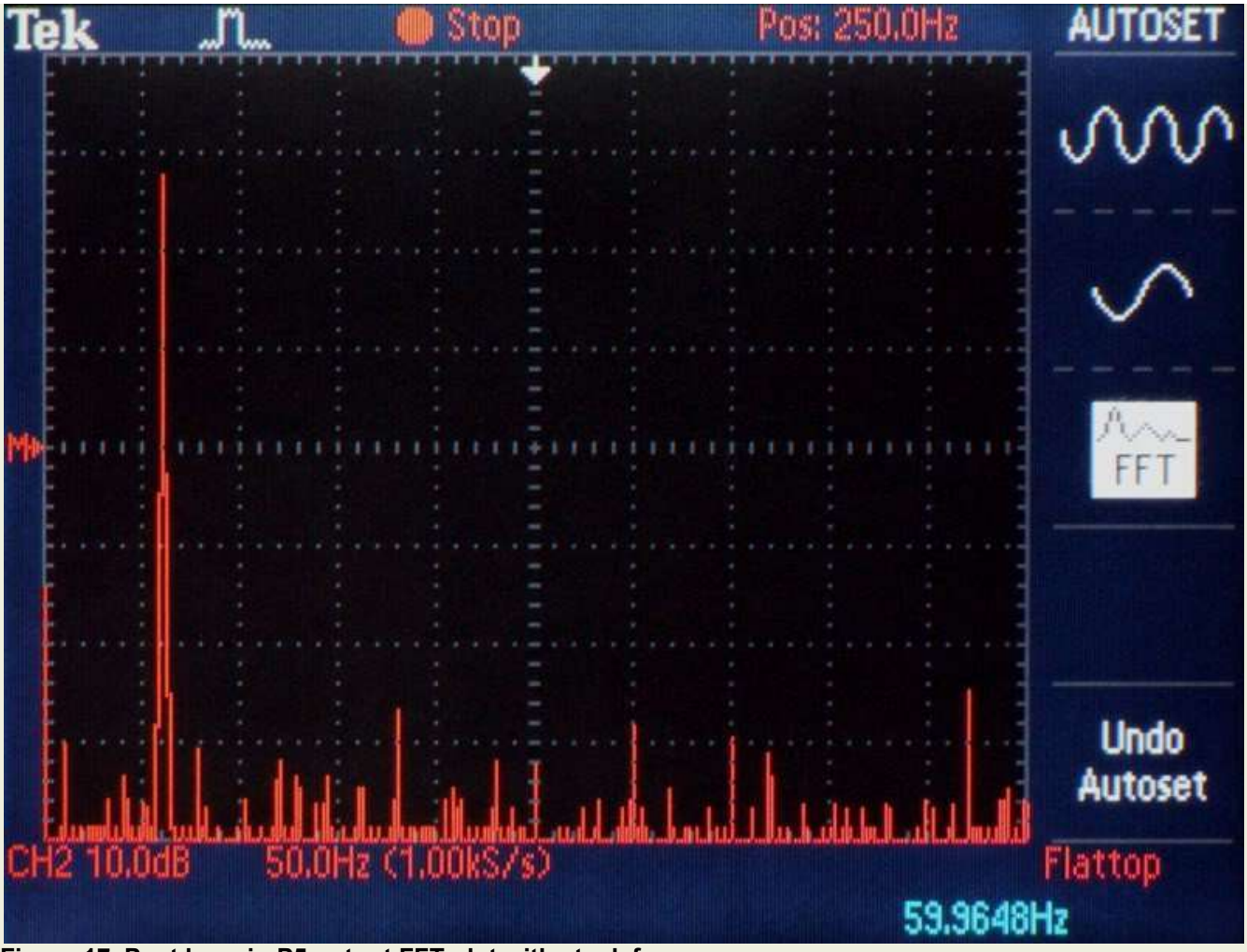


Figure 17. Post burn in P5 output FFT plot with stock fuse.

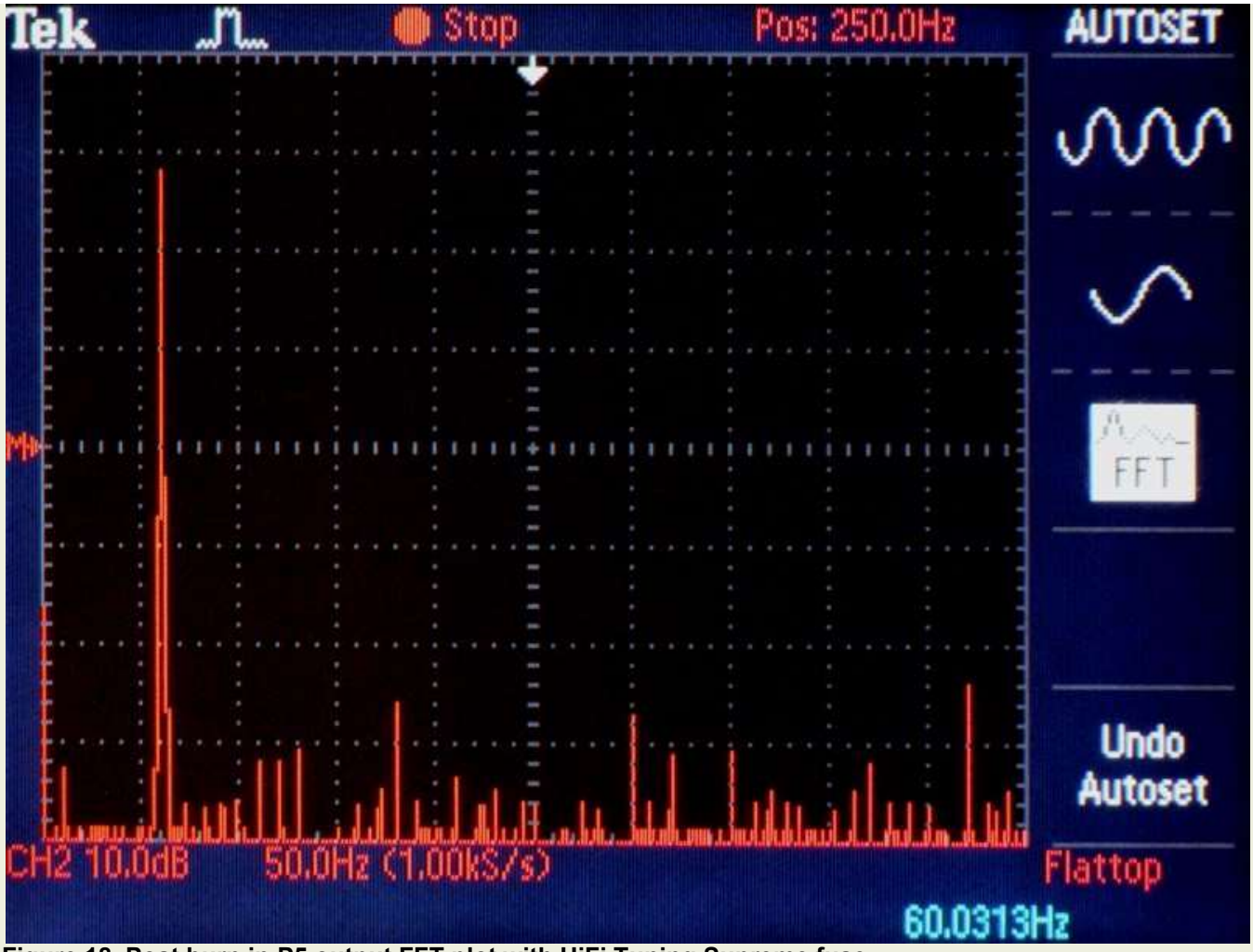


Figure 18. Post burn in P5 output FFT plot with HiFi Tuning Supreme fuse.

Part 9

1. Conclusions

Nitpicks

I would like to be able to adjust the display brightness with the remote. The display can only be turned on and off with the remote. The display brightness can only be adjusted from the System Setup Screen.

I would like to be able to access the System Setup Screen with the remote.

I would prefer the outlet pairs in the normal upright orientation rather than laid on the side.

Trepidations

The quality issues with the PPP are legendary. I hope such ugliness will not become a part of the P5's (and P10's) history. In 2010, PS Audio introduced some design and component changes that resolved the PPP's remaining reliability issues. The fixes were provided at no cost to the owner (except for shipping back to the factory), even for units out of warranty.

The P5 and P10 were released in January of 2011. There were some firmware issues that were resolved in March 2011 and September 2011 with firmware updates. There are still two minor firmware issues mentioned earlier in this report. My initial intent was to wait a year before trying a P5 in order to make sure all the bugs were worked out. However, I ran across a great deal on a one week old demo unit and I jumped on it. Other incentives were the $1000 trade in allowance for PPP's and the upcoming $500 price increase in December 2011.

Further Study

If you have power amplifiers that are not totally or significantly biased in class-A (like the Parasound JC 1's), then it is possible to power an entire system with one P5. I began to see reports of people who were selling or trading in their P5's for the larger capacity P10, even though they didn't need the extra headroom to power their systems.

It was particularly curious to see P5 owners moving up to the P10 when they were only using a small fraction of the P5's output to run source components and preamplifiers. My source components only presented a 14% load to the P5 (110 watts, 1.20 amps), but I had achieved **Such Good Sound** with the P5 that I was enticed to hear for myself what all the P10 furor was about.

Figure 19. Unlike the PPP, the P5 greeted its potential replacement graciously and without protest.

Figure 20. P10 front.

Figure 21. P10 rear. The P10 uses higher grade Power Port Premier outlets. The P5 uses Power Port outlets.

Figure 22. P10 installed.

The P5 was sold. The repaired PPP was traded in for a P10. Now I understand why people are trading in and selling their P5's for P10's: the P10 gives you more of what you like from the P5...but that's a topic for another thread.

References

Studies On Residential Power Line Noise Part 1-Statement SC Power Cord

Studies On Residential Power Line Noise Part 2-Statement SC Power Cord

Studies On Residential Power Line Noise Part 3-PS Audio Power Plant Premier

Studies On Residential Power Line Noise Part 4-PS Audio Premier SC Power Cord

Studies On Residential Power Line Noise Part 5-PS Audio Power Port Premier

Studies On Residential Power Line Noise Part 6-PS Audio Soloist Special Edition

Studies On Residential Power Line Noise Part 7-HiFi Tuning and Isoclean Fuses

Studies On Residential Power Line Noise Part 8-Audio Grade Fuses For Home Theater

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