Amplifier Performance Report

Report Date: February 3, 2015
Customer Name: SAMPLE
Manufacturer: Dynaco
Model: SCA-35

Special Notes:

Amplifier appears unmodified and %100 original. It is in good overall cosmetic condition.

The purpose of this Amplifier Performance Report is twofold:

First, the report will precisely quantify your amp's current performance in relation to its original manufacturer's specifications. To do this in an accurate and reliable way, AEA uses only calibrated lab-quality instruments.

Secondly, the report will provide diagnostics. Our experienced engineering team turns the measurement information into insights that can be used to trouble shoot problems, as well as provide preventative maintenance for your amplifier.

Think of this report as the equivalent of a "full body scan" to assess your amplifier's heath and provide expert advice on solving any problems found.

Understanding Amplifier Specs

The 5 key specs for power amplifiers are output power, frequency response, distortion, crosstalk and noise. Below are the manufacture's published specifications for each of these, along with the actual amounts we measured for each channel. AEA uses calibrated lab-quality instruments to ensure accurate and reliable information.

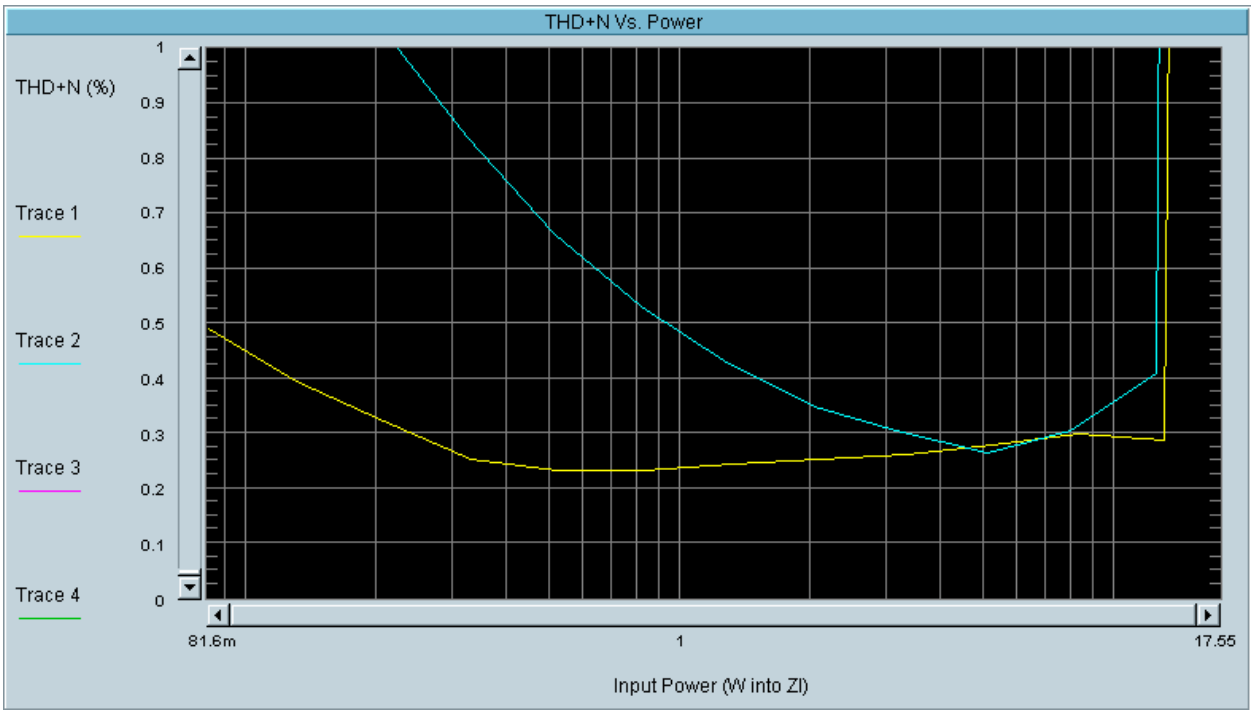
Note: In all graphs the **Left Channel** is shown in **Yellow** and the **Right Channel** is shown in **Blue.**

Maximum Power Output (RMS watts per channel into 8Ω)

Power output is roughly equivalent to how loud you can pump out music. Maximum power output is the amount of power the amp can put out while remaining within its specified maximum distortion spec.

Channel A (Left)	Manufacturer's Spec: 17.5 Watts	Actual Measurement: 14 Watts
Channel B (Right)	Manufacturer's Spec: 17.5 Watts	Actual Measurement: 12.5 Watts

The graph below shows your amplifier's distortion percentage at various output power levels. The vertical scale is increasing % distortion and the horizontal scale is increasing power (watts into 8 ohms).



How to read the graph:

THD vs Power is shown over an increasing range of power levels with both channels driven. The point at which distortion suddenly increases is the amplifier's maximum output, or clipping point. The distortion should remain well below the manufacturer's % distortion specification until after maximum rated power is reached.

Diagnostic Comments:

Right channel apparent low power rise in THD+N in is due to excessive hum and noise. Power output is slightly down in both channels, most likely due to weak tubes and or incorrect biasing.

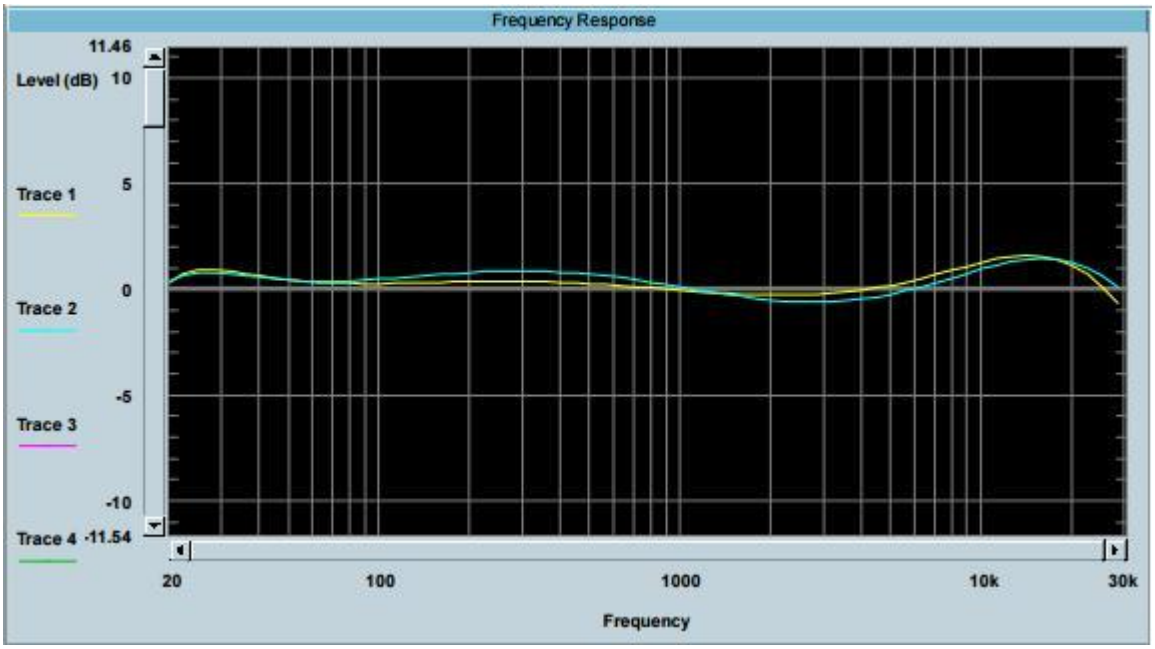
Frequency Response (at max power 20Hz to 20kHz)

Frequency response is a measure of how well your amplifier "responds" to different frequencies in the input signal. It's measured in plus or minus dB over a fixed frequency range. The smaller the variation the better. Since the human ear can only hear frequencies above 20 cycles per second (20 Hz) and below twenty thousand cycles per second (20 KHz), the specification is often given only for this range of frequencies.

Channel A (Left)	Manufacturer's Spec: +- .25dB	Actual Measurement: +- 1.8 dB
Channel B (Right)	Manufacturer's Spec: +- .25dB	Actual Measurement: +- 1.75 dB

Frequency Response Graph

To help evaluate how well your amp responds to a range of frequencies, we have recorded its response to different sound frequencies in the graph below.



How to read the graph:

Reading the graph is actually pretty simple: It shows the range of frequencies (from low to high) horizontally and the amplifier output in Decibels (dB) vertically. The frequency range represented on this graph is 20Hz to 20,000Hz (20kHz), which is the maximum range of human hearing. The frequency response should be nearly flat — the less variation the better.

Diagnostic Comments:

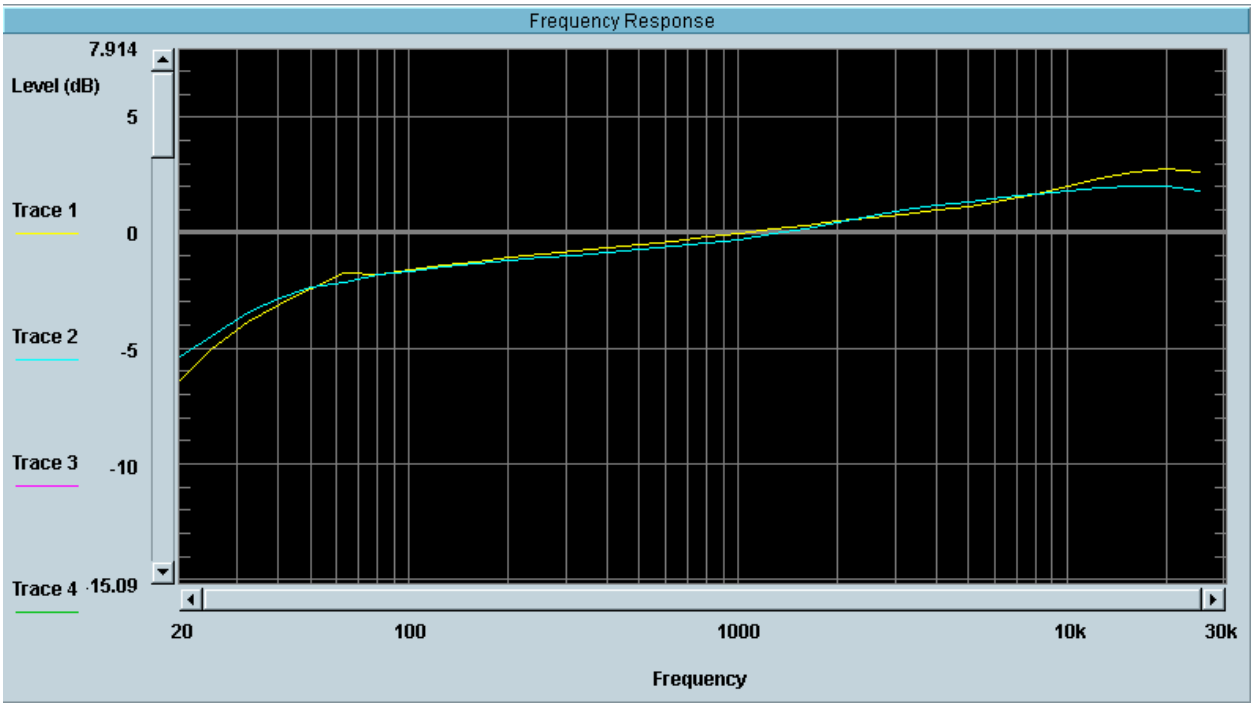
Frequency response is only slightly out of spec in both channels (from line level inputs). Since total error is less than 2 dB no specific action is needed.

Phono Preamp Stage RIAA Equalization Frequency Response

RIAA equalization is an industry standard specification for the recording and playback of phonograph records. It is a form of pre-emphasis used when the record is made (cut) combined with an equal and opposite de-emphasis on playback. Accurate RIAA equalization is critical to phono preamp performance.

RIAA Equalization Graph

As components such as resistor and capacitors age, their values often change. Even small changes can cause the phono stage to apply incorrect RIAA equalization, resulting in 'tonal coloration' and phase distortion. The chart below shows how well each channel of your phono preamp stage follows the precise RIAA standard over the range of 20Hz to 20 KHz.



How to read the graph:

The chart is made by applying precision RIAA pre-emphasis to the test signal input to the phono preamp stage. If the phono input stages de-emphasis equalization is in perfect compliance with the RIAA standard there should be a flat line at zero deviation. The flatter this line is the better. Any deviation present should be below the manufacturer's specification over the entire frequency range.

Diagnostic Comments:

Phono preamp is not within specified RIAA equalization compliance. Base response is severely down below 80 Hz and high frequency response is excessive, especially in Left channel. Cause is most likely out of tolerance components in the phono equalization feedback loop. Action should be taken to ci=correct equalization if phono inputs are used.

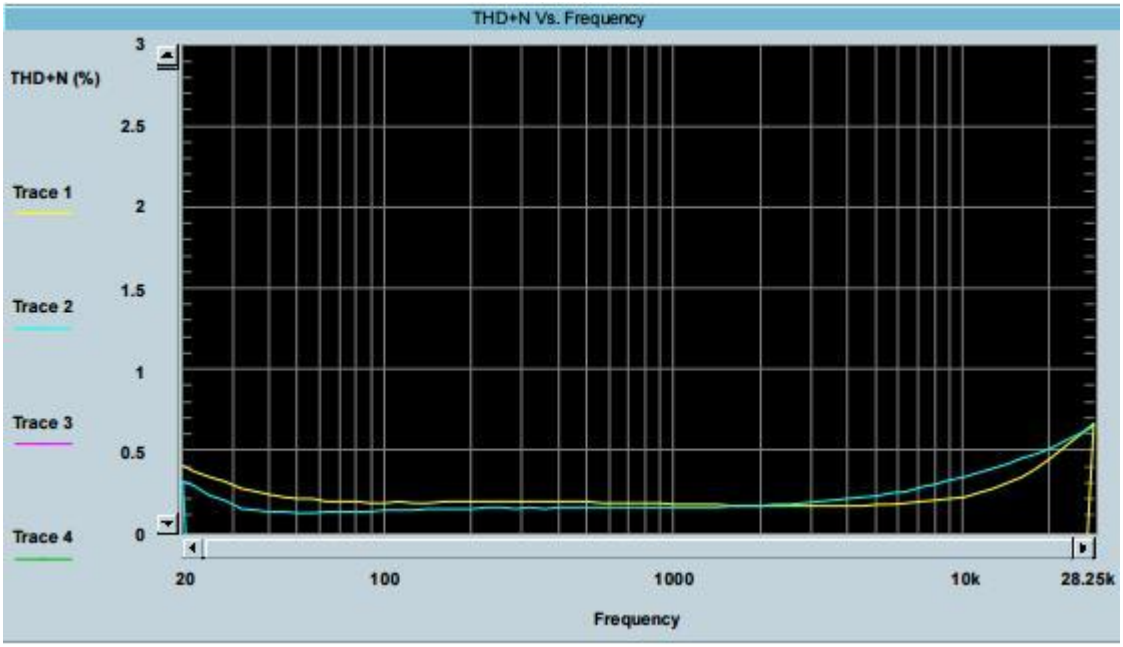
Total Harmonic Distortion + Noise (THD + N)

Total Harmonic Distortion + Noise (THD + N) is a measure of the effect the amplifier has on the sound output (distortion) as a percent of the total output. A completely transparent amplifier would have zero percent distortion. The lower this figure, the closer the output of the amplifier will be to the original recording.

Channel A (Left)	Manufacturer's Spec: <.2%	Actual Measurement: .4%
Channel B (Right)	Manufacturer's Spec: <.2%	Actual Measurement: .5%

THD+N Graph

To help evaluate the distortion of your amplifier over a range of frequencies, we have recorded its percentage of distortion at different sound frequencies in the graph below.



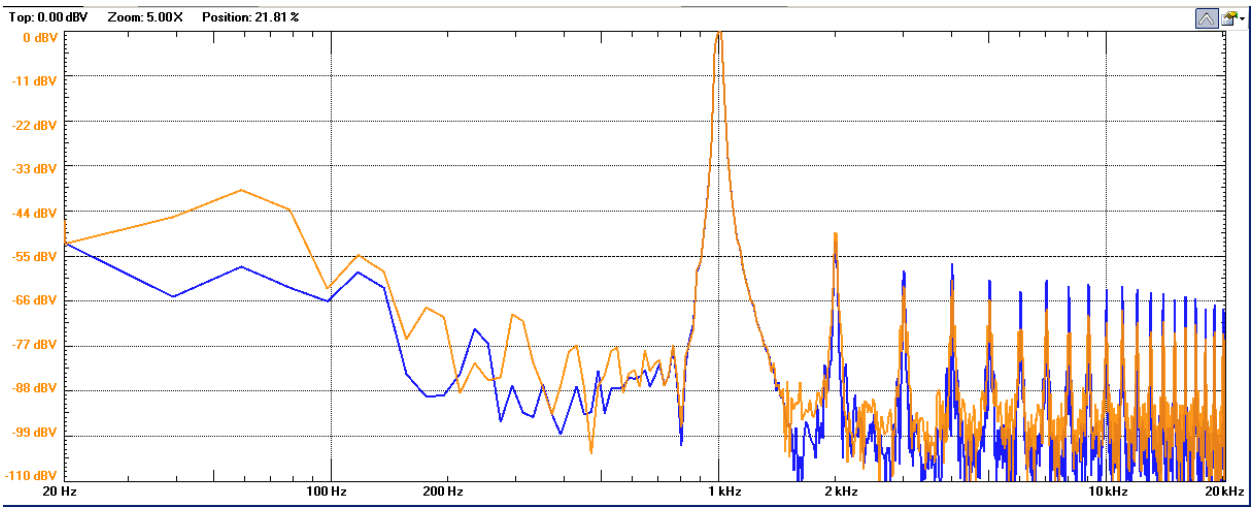
Ideally the percentage of distortion should be well below the manufacturer's specification over the entire frequency range.

Diagnostic Comments:

THD+N is outside spec above 8 KHz in Right channel. Most likely cause is incorrect output tube bias or driver balance. Recommended action: critical adjustment of output tube bias and driver balance.

Spectral Analysis of Distortion Products

In order to analyze the harmonic content in your amp's distortion we have measured the distortion products produced by a pure 1 KHz tone at maximum power. Each harmonic is plotted by their frequency in the "Spectrum Analysis" graph below. While the total amount of distortion (THD) is important, it's actually the types of harmonics contained in the distortion that determine how an amplifier sounds. Odd order harmonics, especially the 5th, 7th and 9th harmonic, are the ones that cause the most unpleasant sounding types of distortion.



How to read the graph:

The distortion of a waveform relative to a pure sinewave can be measured by separating its constituent harmonics. This allows measurement of each harmonic's amplitude relative to the reference sine wave (fundamental). Each harmonic is a multiple of the test tone's frequency of 1 kHz. They can be seen as individual blips trailing off to the left of the test tone in the center of the graph.

Diagnostic Comments:

Low frequency AC hum is apparent. Excessive odd order harmonics in both channels. Most likely cause is incorrect output tube bias or driver balance. Recommended action: critical adjustment of output tube bias and driver balance.

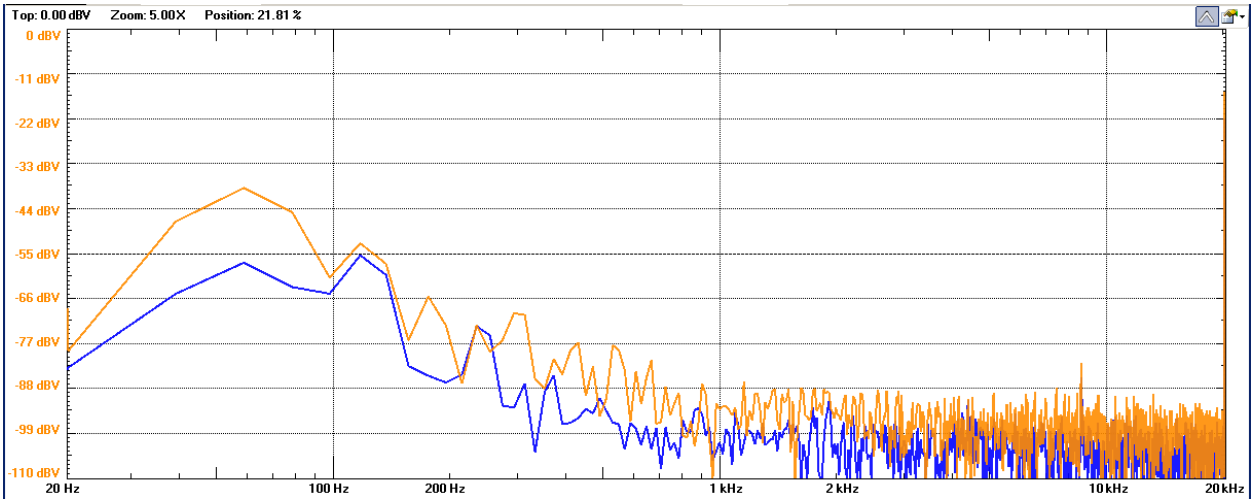
Signal to Noise Ratio (SNR)

Signal to Noise Ratio is the amount of noise contained in the amplifier's output compared the music. In all amplifiers there is always a very small amount of noise from the electrons whizzing around, bumping into things. The goal is to make this background noise imperceptible, meaning a very high signal to noise ratio is a good thing.

Channel A (Left) Manufacturer's Spec: -80dB Actual Measurement: -40dB
Channel B (Right) Manufacturer's Spec: -80dB Actual Measurement: -58dB

Spectral Graph of Noise:

In order to analyze and help diagnose noise and hum in your amplifier we have recorded the spectrum of each channel's noise in the graph below.



How to read the graph:

The graph shows the amplitude in of each channel's noise components with the volume control set to maximum. The vertical scale is the amplitude in reference to the amplifier's Maximum Power Output in dBm over the range of 20 Hz to 20 KHz. Ideally all noise components should be well below the manufacturer's specifications.

The noise spectrum is an important diagnosis tool when evaluating vintage amplifiers. Especially important is noise in the low frequency range of 60 and 120 Hz. Excessive noise in these frequencies indicated "hum" caused by faults in the amp's powers supply. An increase in high frequency noise can be a sign of bad component such as resistors, or instability in the amplifier's output stage.

Diagnostic Comments:

All of the excessive noise is caused by low frequency hum issues as previously mentioned above. Noise levels look to be within spec at higher frequencies.

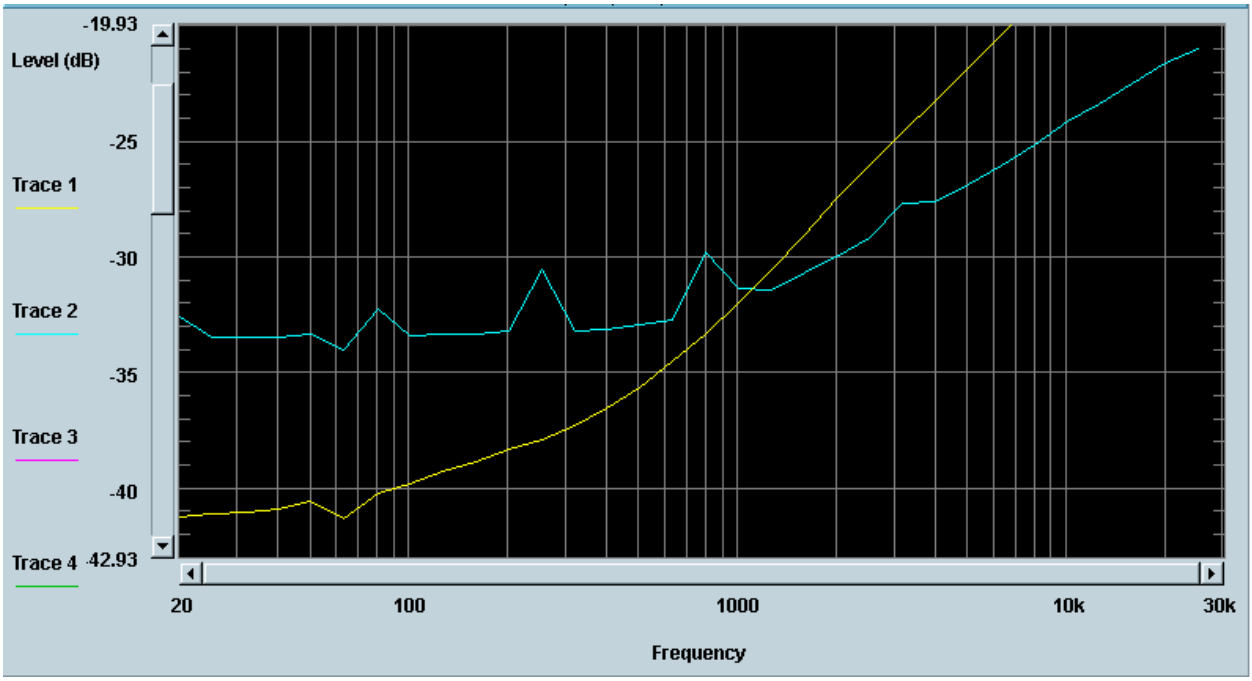
Crosstalk

We all know the left and right channels are supposed to be separate, and drive separate speakers on separate sides of the room. Crosstalk is a measure of how much undesirable left input signal is mixed with right output signal (or vise-versa). With low crosstalk it's easy to hear that the singer is a little left of center stage and the violins are towards the right. The more crosstalk there is, the harder it is to pick out the positions of the instruments within the stereo image, or "soundstage."

Channel A (Left)	Manufacturer's Spec: N/A	Actual Measurement: -16dB
Channel B (Right)	Manufacturer's Spec: N/A	Actual Measurement: -21dB

Cross Talk Graph:

Cross talk is not always specified in the manufacturer's specifications, but must be greater than -25 dB to preserve proper soundstage imaging. Due to the fact that the amount of crosstalk varies with frequency, we have plotted each channel's crosstalk by frequency in the graph below.



Crosstalk is measured in negative dB (-dB). The more negative the better.

Diagnostic Comments:

The unit has excessive high frequency crosstalk, especially in the Left channel. Most likely caused by corrosion in switches and component interconnections along with poor lead routing. Suggested action is ultrasonic cleaning and improved lead routing.