The Dynaco Tube Audio Forum

Dedicated to the restoration and preservation of all original Dynaco tube audio equipment - Customer support for Tubes4hifi VTA tube amp and preamp kits and all Dynakitparts.com products

HUM and its Causes

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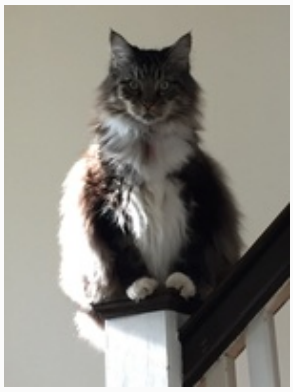
Peter W.

HUM and its Causes
by Peter W. on Thu Jun 20, 2019 8:48 am

Post n°1



Peter W.

Posts : 1326
Join date : 2016-08-07
Location : Melrose Park, PA

Rant and Snark Warning
ON HUM

Some definitions:

HUM – Type A: 60 hz hum (50 for our international friends except parts of the Middle East). Otherwise known as Mains Hum. This is caused by:
• Induction – some component or wire is carrying mains current next to another component or wire, and just as a transformer use induction to pass current from one winding to another, this hum is 'induced' where it should not be.
• Poor Power-Supply Shielding – as above, but not accidental. If the power-supply is too close to, or not properly shielded from the audio circuits, there will be hum.
• Failing rectifiers – if the rectifiers, tube or solid-state are leaking AC, there will be hum.
• Poor, simple or "just enough" design – as an example, vintage AA5 radios had no power-transformer, and were designed to the absolute minimum performance standards. Just enough was often too much.

HUM – Type B: 120 hz hum (100 as above). Otherwise known as power-supply hum. This is caused by:
• Inadequate filtration – either through failure or insufficiency. Which, if the power-supply is passing chopped DC can also cause:
o Induced hum
o Poor shielding hum
Either of the above hum sources may be 'transmitted' between components via a poorly executed and/or misunderstood grounding scheme. More on this later. But, guys and gals, this is it for hum sources.
Which is why it is critical to know WHAT KIND of hum one is experiencing – and, by the way – often enough it is both with vintage stuff. Solve one problem, find the other hidden behind it.

HUM LOOP:
• Caused by differences in potential between components, or elements within components, when connected together. Typically because:
o The grounds are daisy-chained rather than to a single common ground.
o There is, for some reason, significant potential between the local ground and the neutral. This is usually, but not always, a household wiring issue. NOTE: Not defect. Issue. Safety grounding is not hardly the same as audio grounding – although they share the same space, and are often the same system.

POTENTIAL:
• There are three 'elements' of grounding. And some of these vary from location to location, from code to code. They are:
o Utility Ground – this is the ground as provided by the utility. It is often remote from the user. This ground is relevant to, but not really a part of this discussion.
o Local Ground – this is the ground provided at the user location.
o Neutral – in North America, the neutral and the Local Ground are bonded in the user electrical panel, and once again at the local utility transformer. In Europe, the Neutral and Utility Grounds are often not bonded until the distribution transformer, often large distances from the user. What it means is that in such cases, the Neutral may be well 'above ground' relative to the local ground.
• So, any difference in potential (how far 'above ground' each of the two primary user grounds might be from each other is what is meant by POTENTIAL in this case.
Now, as it applies to your equipment:
Most power-amplifiers meet their rated outputs at about a 2-volt input. So, actual input may be anywhere from a tiny fraction of a volt, to several volts, depending on pre-amp design. So, if there are tiny fractions of spurious AC floating around in the system that are picked up by the pre-amp (separate or section), they will get amplified.
Phone head-amps take millivolts and make them into volts. As above, any spurious signal will get amplified, passed on to the pre-amp, then amplified again. Twice, then, as noted.

So, we really, really, really want to control hum!

Aside:
a) Phono head-amp design for magnetic cartridges has been established science since the 1960s, and for MC, since the 1970s. To the point where it is a trivial exercise to produce a reliable result.
b) There is no reason on the planet that a phono head-amp should have any level of inherent hum. Tube, solid-state, battery, mains or otherwise.
c) A shorted-input phono head-amp will HISS at high volume, but should otherwise be as quiet as the proverbial mouse.

So, if a phono head-amp is humming, SOMETHING IS WRONG. It is NOT the nature of the beast. And that hum will have only the sources as discussed. So, to eliminate the hum, one must start, systematically and carefully down the list, eliminating each source in turn – and with the full understanding that there may well be multiple causes. It is my *opinion* that because the science of a phono section is so trivial that, today when such devices are unusual, the designers of same are suspicious of the triviality and vastly overthink it. William of Occam suggested that we eschew needless complexity. He was, and remains absolutely correct in offering that advice.

Now, the snarky part: Guys and gals, we all of us have different levels of experience and skill, and we all of us have the same essential goals – to enjoy (mostly) tube audio with (mostly) a Dynaco flavor past and present. But, we really do need to understand some of the basics as they apply specifically to tubes – which are rare and dangerous beasts with the ability to kill or charm in very nearly equal measure if abused. And abuse-by-neglect is still abuse.

LeGrace

Re: HUM and its Causes Post n°2
by LeGrace on Thu Jun 20, 2019 4:49 pm

I have no idea which hum type I had to begin with. All I can say it was highly annoying and nothing I tried to rid myself of it worked. Then I read about a simple low cost hum killer device that only costs around a fin for a pair. It converts a 3 prong plug on my tube amp to 2 prong. Working perfectly, no more hum.

LeGrace

Posts : 287
Join date : 2016-08-07
Location : Ontario, Canada

Bob Latino

Re: HUM and its Causes Post n°3
by **Bob Latino** on Thu Jun 20, 2019 7:37 pm

Bob Latino
Admin

Posts : 2768
Join date : 2008-11-26
Location : Massachusetts

> LeGrace wrote:
>
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What you describe is a classic example of a "ground loop". It can happen if two or more components in your music system have 3 wire cords. You use the 3 wire to 2 wire "cheater plug" to lift the ground on ONE of the components and usually that will take care of the problem. Note that there are a number of other reasons for hum/buzz in your music system and the cheater plug will not take care of all hum issues.

Bob

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erhard-audio

Re: HUM and its Causes Post n°4
by erhard-audio on Fri Jun 21, 2019 10:41 am

erhard-audio

Posts : 143
Join date : 2017-04-07
Age : 61
Location : Tucson, AZ

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William of Occam suggested that we eschew needless complexity. He was, and remains absolutely correct in offering that advice.

could not agree more!
And not just a phono preamp, ALL preamps or amps should NOT hum, be they tube or solid state!

Wharfcreek

Re: HUM and its Causes Post n°5
by Wharfcreek on Mon Jun 24, 2019 9:20 am

Wharfcreek

Posts : 10
Join date : 2017-07-15

I did a similar thread to this one some time back on another forum. At that time, I started a new club:

Hum-Fighters Anonymous

With all the problems I've had with 'hum' over the years, this kind of info is invaluable. Nice job!

Tom D.

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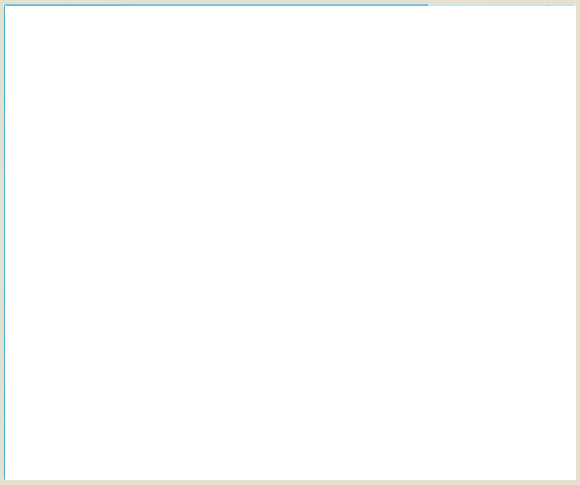

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