I just finished building your Stereo Valve Preamplifier (January & February 2016; www.siliconchip.com.au/Series/295) and am very happy with its sound. I wanted to "bling it up" so I have just finished adding the LED Audio Meter (June/July 2016; www.siliconchip.com.au/Series/301) and it looks great! Unfortunately though, it introduces a significant amount of high frequency noise (my guess is somewhere between 2-8kHz) into the sound system, rendering the meter unusable.

I was hoping you might be able to give me some insights into tracking down the cause. I have been through the board looking for bad joints however I haven't spotted any obviously dodgy ones.

With no audio connections, the board makes a noise that can be heard with your ears alone. This is a similar frequency to the noise introduced into the sound system when it is connected. The noise may be coming from the power supply end of the board however it is hard to pin down. The noise is louder when some of the bar LEDs are lit.

With the unit connected to an oscilloscope, I had a look at the power supplies and the input. With no LEDs on, the 3.3V rail (from REG1) is at 3.24V DC and swinging ±17mV in a triangle wave at about 3.3kHz. With no LEDs on, the 11.2V rail (REG2) is at 11.19V DC and swinging ±1mV with a messy looking wave.

I changed the range to 100dB and peak to -10dB to get some LEDs lit just from noise. With no audio connections, the board noise that can be heard with ears alone was louder.

Something is going on at regular interval (3.5ms) which produces spikes on the 3.3V rail of +70mV. So I suspect something to do with this rail is the culprit. Any thoughts on whether what I sent through is normal or how I might go about getting rid of the noise? (J. M., Leeming, WA)

● That certainly is mystifying. While you would expect a little noise on the 3.3V rail due to the current transients from multiplexing the LEDs, it certainly should not be audible, nor should it be fed back into the audio signal.

Our prototype did not behave as you describe. It sounds like the regulator or one of its bypass capacitors is not doing its job properly. We suggest you try replacing the capacitors at the input and output of REG1, or try using higher value/lower ESR capacitors in these locations.

(We received an update from the constructor: "I was looking at the circuit diagram and noticed some of the 2.2µF capacitors were marked X7R. I then noticed three of the supplied 2.2µF capacitors were bigger than the rest. I decided to move the bigger 2.2µF capacitors to the input and output of REG1."

"The audible noise with no audio connections still exists, however it is now not being transferred into the audio system. Yay!"

"I believe the X7R is just a temperature rating and given nothing seems to get warm in this circuit, I can't work out why the temperature rating on capacitors would make a difference. There is no significant difference in the waveforms on the oscilloscope."

"The solder joints now look slightly worse than before due to component change however still passable. Any idea why it might be fixed?")

We suspect it was a bad solder joint. It's quite easy to solder an SMD capacitor and get a joint which looks OK upon casual inspection but has adhered to the capacitor and not the PCB pad, forming a very high resistance connection. It's also possible one of the capacitors was a dud and swapping them simply moved it to a less critical location.

X7R is more than just a temperature rating; it's a tolerance rating (including over temperature) but affects the type of ceramic used and physical construction of the capacitor.

Because X7R material has a lower dielectric constant, more layers need to be used than for say Y5V, resulting in a lower ESR capacitor. So X7R capacitors are generally superior to other common types ceramic capacitors with the exception of C0G/NP0.