

Car Stereo Replacement

Steak Electronics

10/27/19

1 Overview

Replacing a car stereo.

2 Work Log

2.1 I2C OLED display

Just for fun, I bought an I2C oled display and are going to use it to display something. Notes on this: Using the adafruit SSD1306 and GFX library (this procedure is well covered in other places), you can load an example sketch and get it running. First thing to change is to remove the Adafruit logo and replace it with my own. Let's do that.

From <https://design.goeszen.com/convert-image-for-oled-display.html>

I'm on Linux here and found that the readily-available ImageMagick package will do

```
convert some_image.png some.image.mono
```

That's efficient. But it didn't really work out. Too much work, I don't need it that bad. Have to convert it to something the c compiler can read.

2.2 Internal AVR Temperature Sensor

For starters I setup the code to read from the internal temp sensor on the duino. However there is also this:

<https://thecavepearlproject.org/2019/02/25/no-parts-temperature-measurement-with-arduino-pro-mini-to-0-005c-or-better/>

This would be something to do for more resolution. The built in sensor is not very good, so this above link would be great. Hack a day also covers it.

3 Wiring Pinout is wrong on Internet - Cable has labels

I looked at the picture I have detailing the pinout (Delco Delphi radio wiring diagram.jpg in resources). It's close, but not 100% correct. I found that the cable itself has small text labels on each wire which explain which everything does. I didn't notice earlier, as I didn't look close enough (and no one mentioned this).

4 Arduino VReg Blowout

I had a knock off Arduino Nano, and the vreg blew out. I have some other vregs to replace it.

5 AC Audio Coupling to Remove DC Noise from Auto

I had some fun with this one. Many videos on this. I started with the speakers being directly fed by the amplifier. This worked, but there was some noise coming through. Cars are noisy, this is not surprising. I would've preferred the amplifier to isolate the outputs, but no luck... At this point, I considered two options. 1) Use a transformer to block DC. 2) Use capacitors to couple AC.

5.1 Ground Isolator

I had been given a Ground isolator, which was two small transformers on a pcb intended to pass audio from a car powered signal source into the car speakers. I tried this isolator on the output of the speakers, and while it worked, the volume was lower, and it was impractical. I knew as soon as I heard the volume, that the issue was an impedance matching problem. The transformers were too small. They were intended for signal sources, not amplifier outputs. Onto option #2.

5.2 Capacitor Audio Coupling

My initial thoughts here were: "Let's be careful and use non polarized caps". I bought some 0.22uf and 0.022uf polyester film capacitors at Electronics Plus, the local radioshack replacement, and tried them. No sound. After

adjusting the connectors (which were admittedly loose - it's easy to push them back on the amplifier if you are not careful) I found that the capacitors didn't work. There were two issues. 1) I only used one capacitor on the + output of the speaker amp, but the Amp biases the signal 6 volts. So I needed two. After that was resolved, the signal came through on the output of the capacitor, as viewed on the scope, however there was no sound output. I tried the safe way. It's time to break some rules.

I grabbed some 1uf caps I had, and tried these. Again, no sound. Not giving up, I grabbed some 1000uf caps, and tried once more. Now I had sound.

5.2.1 Impedance / ESR of capacitors failing to pass enough power of signal

Capacitors are rated for impedance. Some data sheets also call this ESR. It's not an issue in this case, if you are using the capacitor as a DC reservoir, but if you use it in an AC coupling situation then things get interesting. A high impedance, or ESR will block what a low one won't. In this example, it's as simple as the Amplifier either being able to power a speaker or not. Higher capacity caps will have lower impedance. See the picture.