Hack the Scosche FMT4 FM Transmitter!

Written By: Chris

TOOLS:

- Clamp (Squeeze clamp, c-clamp, duct tape... ;)) (1)
- Jeweler's screwdriver set (1)
- Multimeter (1)
- Soldering/desoldering tools (1)

PARTS:

- Various colors of small-gauge wire (I used 22g cat 5 wire) (1)
- A compact 12v -> 3v regulator (1)
  I built a variable-output power supply out of Radio Shack parts. If you want my power supply, pick up a Radio Shack LM317T adjustable regulator, about 230 ohms' worth of fixed resistor (I used 2 470-Ω Radio Shack 2711115's in parallel), a 0.1 f cap, a 1 f cap, a 5k-Ω pot, and some disused 22 gauge cat 5 wire.
- A cigarette lighter adapter (1)
  ...or whatever you need to connect to your 12v power source. Radio Shack sells clamp-style cigarette lighter adapters, or you may have one your can cut up and repurpose.

SUMMARY

I suggest that anyone who is interested in this project do the V2.0 version instead. It is easier, safer for the PCB, and should yield practically the same results. The SWR is probably higher, but I can't tell a difference in the field.

Do you want a cheap car FM transmitter with (unlike most of the products you can buy) great audio quality and great signal strength? You want to get yourself a Scosche FMT4 and hack it!

It is worth pointing out that someone who is willing to do this level of work could more easily change their car stereo for one with an AUX input, but my way is cooler and cheaper. :p

I am not someone who normally hacks stuff (as you'll be able to tell when you see the soldering photos :P), but I was annoyed by the lack of a decent cheap car FM transmitter. Annoyance is the mother of invention, apparently. :p

This is technically illegal in the US, but so is transporting dentures, so take it with a grain of salt, I guess.

My suggestion for avoiding legal issues would be this: "Don't be a jerk". Use an unoccupied frequency, and use the minimum power that you need to be happy. This can mean shortening the antenna (use a quarter-wave or an eighth-wave instead of a dipole), or (possibly; unconfirmed) lowering the input power.

A brief test led me to believe that transmit power increases as input power increases, but I've never seen a schematic of this thing (or a datasheet for the chip). At some point I will try to make time to check reception at various points with various input voltages to validate this theory. (Did you ever wish you had an oscilloscope?)

Step 1 — Hack the Scosche FMT4 FM Transmitter!

- Update: I came up with a much easier method that requires far less dangerous (to the PCB) soldering and still works great. Unfortunately, I didn't photograph the process, but I'll take some "after" pictures and post them up under a separate guide.

Step 2

- 1) Pop front cover (pry it up carefully with a couple of tiny screwdrivers or a knife and a screwdriver; it's just glued down).
- 2) Scrape adhesive to expose four screws.

Step 3

- Remove screws.

Step 4

- Remove cover. It just pops out. There is a little integral clip securing the rubber strain relief device at the top; it pulls straight off also.

Step 5

- CAUTION. The next step is pretty much certain to result in the destruction of your FMT4 if you are not familiar with basic soldering. Google it. You are about to desolder a large mechanical joint in close proximity to several small surface joints. If you have the iron on the surface for more than a second, you are doing it wrong.
  - My new FMT4 hack doesn't require this desolder. I'll post it up when my camera battery is done charging. :P

Step 6

- The battery contacts on the "top" (audio cable) side of the FMT4 are one solid piece, with two large soldered connections through the PCB. It needs to go. Be gentle and avoid breaking the tiny barely-insulated audio lines, which are a PITA to fix. Start by gently popping the "bottom" of the board (don't rip the switch out of the side; see photo.)

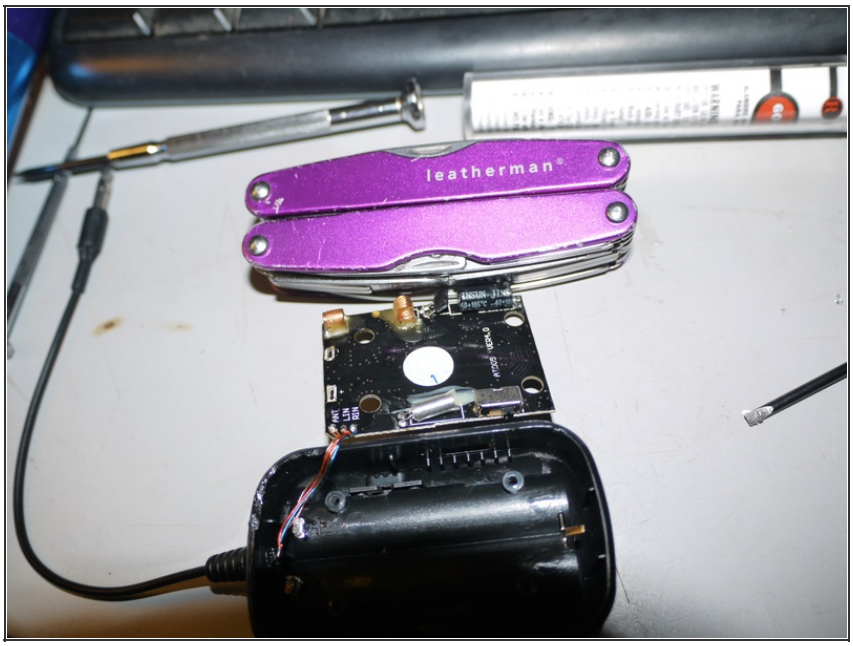
Step 7

- Desolder the battery connector part one: Remove excess solder. Using well-preheated desoldering braid or a vaccuum solder sucker, get the excess solder off of these two joints quickly. You have some delicate stuff in close proximity. Do it fast or bail and reconsider your technique.

Step 8

- Pull the PCB off of the battery connector terminals. This is the hardest part. There is a significant solder blob underneath the PCB, but you need to be sparing with the heat. You also need to use one hand to apply pressure to the PCB. Clamp the case to your work surface and do it in stages (left, right). It took me 5 iterations.
- I did not have the requisite number of hands and/or tripods to take a photo of several steps; sorry.

Step 9



- Pop the PCB out of the case. Use leverage from near the switch so that you don't damage the switch.
- Success! The hard part is over.

Step 10

- Remove the battery cover. Go nuts with the heat; just don't melt the screw posts. Desolder the battery posts that were in the PCB and yank them out through the other side of the case.

Step 11

- Optional: If you're upgrading the antenna, desolder the stock antenna wire. CAREFULLY. Don't desolder the adjacent audio connectors; their little dipped insulation can't take much heat. This is a surface-blob connection. Don't try to desolder it from the "top" of the board — do it from the side that says "ANT" next to the connection.
  - Clip the old antenna wires short so they won't make any unexpected contacts.

Step 12

- On to the power supply. I don't have the components handy to do this over. You do not have room to put them on a nice tidy PCB. I suggest using "liquid electrical tape" or some other form of paintable rubber for insulation. You could just use a 3v regulator package, but then it wouldn't be adjustable.
  - I used a Radio Shack LM317T adjustable regulator (which lets me choose my input power, but makes it a lot harder to fit into the battery case). You also need about 230 ohms' worth of fixed resistor (I used 2 470-Ω Radio Shack 2711115's in parallel), a 0.1 f cap, a 1 f cap, a 5k-Ω pot, and some disused 22 gauge cat 5 wire.
  - Voltage note: I did try this with a fixed 3.3v regulator package, and while it does work, it's too much input voltage and you can hear the overdrive.

Step 13

- There are 4 connections to make in the power supply:
  - 1) The 0.1 f cap, the wiper on the potentiometer, the 1.0 f cap, ground wire to the PCB (make this about 3" long; you'll need to trim it later), and 12V NEGATIVE (aka ground). Make this last wire at least as long as you want the power cord to your car to be!
  - 2) Pin 1 on the LM317T, the 0.1 f capacitor, and 12V POSITIVE in from the car. Make this wire at least as long as you want the power cord to your car to be!
  - 3) Pin 2 on the LM317T, the fixed resistor, the 1.0 f capacitor, and +3.0v out (make this wire a few inches long; you'll need to trim it a bit later.)
  - Pin 3 on the LM317T, one of the non-wiper pins on the varistor, and the fixed resistor.
- Make these four connections temporarily (good mechanical connections with no solder and no tape). Check it VERY CAREFULLY for shorts before going on to the next step. Even a slight jiggle could create a short if your mechanical connections aren't solid. You can use a breadboard for testing if you want something that you can plug in more safely.
  - Bear in mind that when you actually assemble it, it needs to fit into the FMT4 battery compartment, so there won't be any fancy PCB or breadboard. ;)

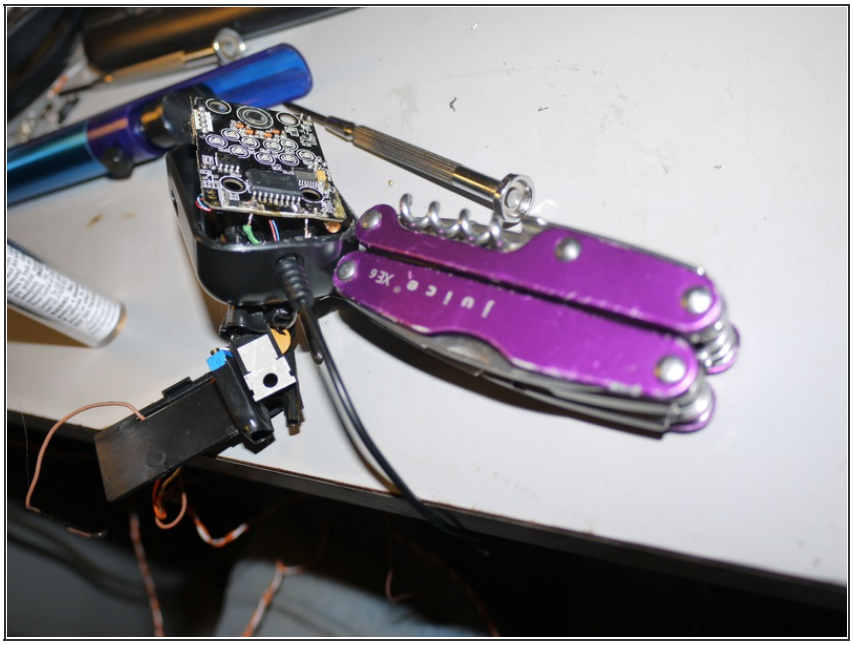
Step 14

- Connect the assembled power supply to a +10-20v power source (such as a car cigarette lighter), and put a multimeter on the output wires. Adjust the pot for +2.4V. Once it works well, take the input power away, work out how to mush the whole mess into the battery compartment, and solder all the joints. Apply liquid tape to prevent shorts.
  - Before soldering, ensure that you can get to your pot screw without creating any shorts. You may wish to adjust this after you have it all together.

Step 15

- If you are replacing the antenna, cut a new antenna wire to the desired length, thread it through the battery cover with the power wires, and surface-mount it where the old antenna came off.
  - Cheat sheet: 88.1 MHz fullwave: 128" Dipole: 64" 107.9 fullwave: 104" Dipole: 52"

Step 16



- Slide the 12v positive, ground, and antenna wires through the slot in the battery cover, and slide the battery cover onto the wires.

Step 17

- Dip "+" in flux and ensure that he has a good mechanical connection. Solder that puppy on. Now do the same for "-".

Step 18

- Poke the antenna wire through the same hole you poked "+" through. Very carefully solder it on. Woe be unto you if you desolder the audio connectors like I did. They are no fun to put back on correctly.

Step 19

- Stick the battery slider switch cover on the switch and jam the whole thing back into the case. Line up the screw holes. Check your solders. I'm sure that your superior soldering skills resulted in no brittle cold solder joints, but check it anyway. ;)

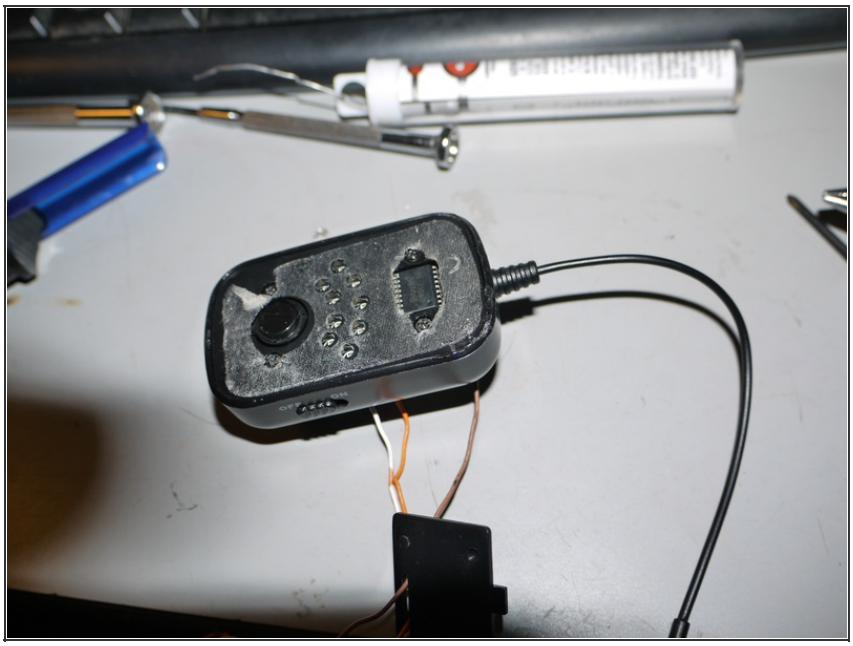
Step 20

- Check for shorts. Use your eyeballs. If in doubt, apply liquid electrical tape. Do not apply power first. :p

Step 21

- Put the appropriate end on the 12v wires. I used a cigarette lighter adapter.

Step 22



- Reassemble the case.
  - Check that your power and antenna wires have proper strain relief. I actually just put a big knotty twist in each one on the inside of the case.
  - Push the audio wires into the chassis with one hand, and put the plastic cover back on with the other. Check that the tiny audio wires are not going to get caught on a screw post. The cover snaps onto the rubber strain relief connector on the audio/antenna cable.
  - Put the four screws back in. I was going to say that a magnetized screwdriver will be your friend here, but I am guessing that anyone who has read this far has already magnetized most of their jewelers' screwdrivers.
  - Stick the front back on. Hopefully your frame will have less soldering iron burns than mine did. :p

Step 23

- Plug it in and test it. You should get crystal clear FM reception. If it's a little shy, try replacing the antenna (see above; that's what the brown wire is in the photo), or increasing the input voltage by turning the screw on the pot. I've gone up to +3.0v with no apparent ill effects. +3.3 is too much.

This document was last generated on 2012-10-31 10:39:38 AM.