Alexandria Radio Club

Replacing the Internal Lithium Ion Battery in a
Kenwood TM-D700A Transceiver

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I 've owned a pair of Kenwood TM-D700A radios for about 15 years. This is a great radio and a versatile packet machine. They were the gold standard for mobile APRS before being replaced by the even more awesome TM-D710G which now has an internal GPS. 15 years is a long time for a lithium ion battery to last and mine would no longer hold the date and time in the TNC. So it's time to swap them out!

Don't have a TM-D700A? The alternate title of this presentation is "Don't be afraid of the inside of your radio". And I'll also provide a couple of handy repair tips.

Some background

- No help on the Internet so I'm on my own!
- Kenwood service manual is almost useless.
- 3 vdc lithium Ion battery is #W09-0570-05 from www.pacparts.com for $15 shipped.
- or send the radio to Kenwood and let them do it for $$$.
- Requires taking a soldering iron to the battery and the antenna jack, and a couple of hours.

I really thought someone would have done this before and posted something helpful. The first radio took about 2.5 hours but I was taking pictures, writing some notes, and trying a couple of options which I'll mention later. The next radio could take an hour.
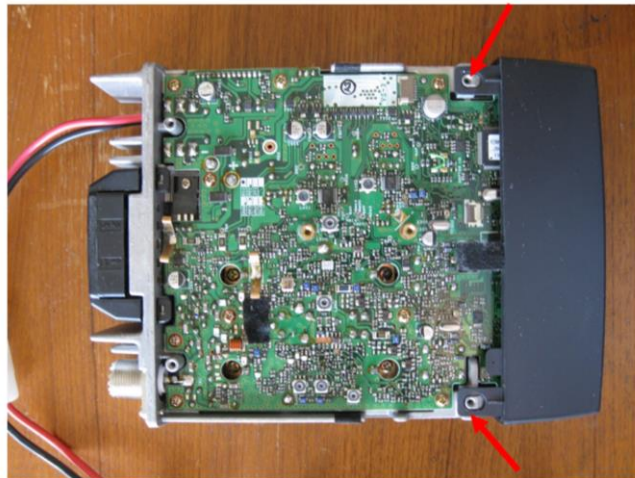
Which soldering iron to use?

Show of hands: We're in close proximity to lots of tiny SMT components. Do we use the big super-hot ancient Heathkit iron with the wide flat tip, or the 15 watt Radio Shack iron with a pencil tip?

Heathkits forever!
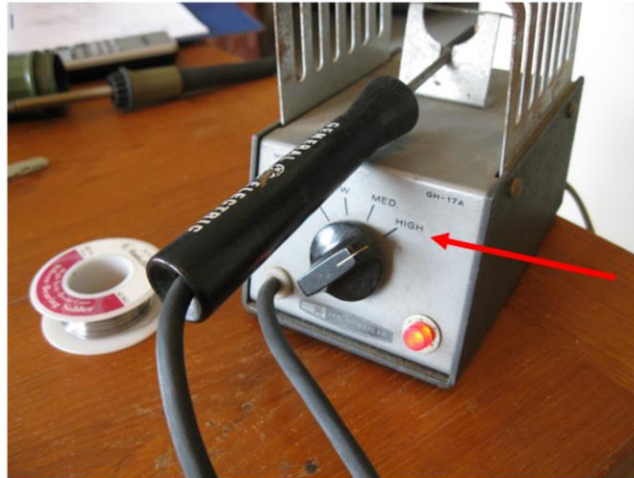
Notice that we set the phasor on stun. The object with SMT work is "work fast".

Remove the top & bottom covers

First we remove the top and bottom covers. This is easy because you've already removed the cover from every item of ham gear you own – right? If not, why not? You're a ham – just do it! 5 screws on top and 6 screws on the bottom. This is the bottom view. Use a #1 Phillips screwdriver. Once both covers are off then you can unsnap the front plastic cover at the 4 corners.
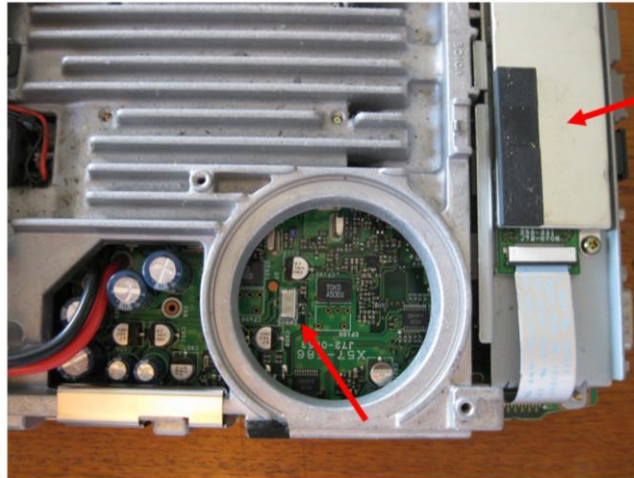
Front cover removed
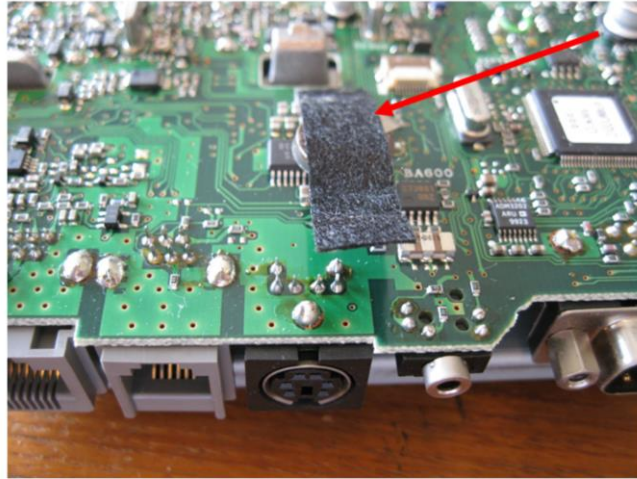
With the front plastic cover removed we spot the culprit. Here's the lithium ion battery covered with a piece of non-conductive tape.
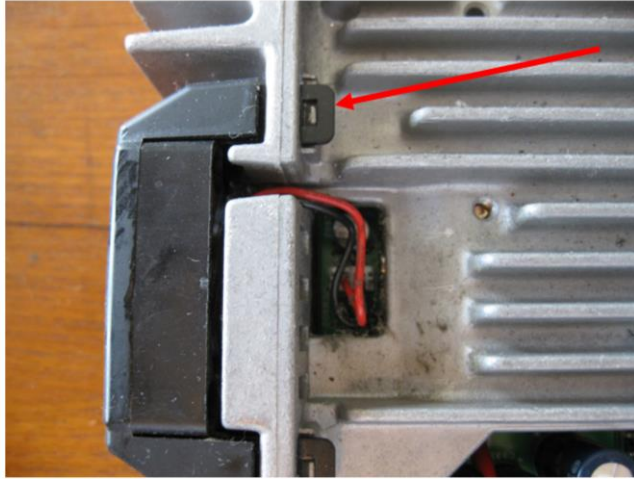
These don't last forever!

Note all the tiny SMT components! I'm using the 'macro' setting on my digital camera – and no flash.

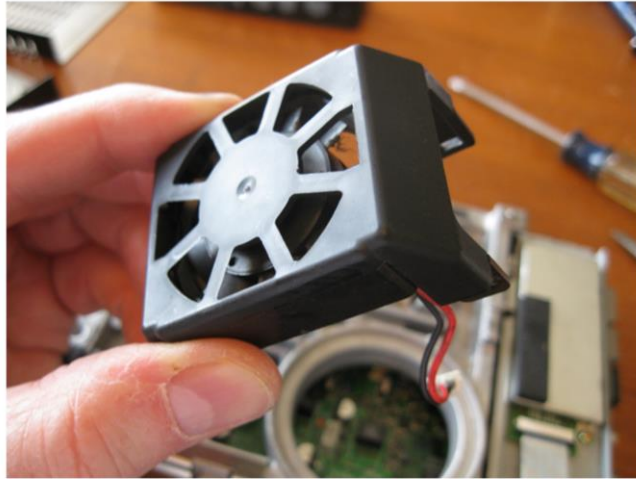Remove the speaker and cushion

The TNC is on the right at the front of the radio. The speaker plug is recessed so needle-nosed pliers helps here.
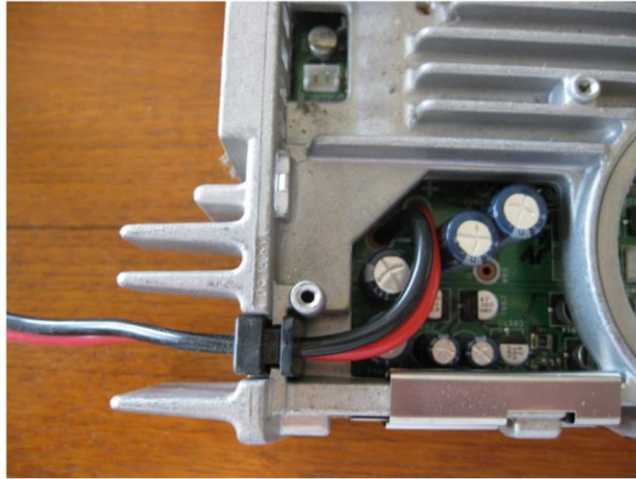
Cooling fan

Both the top and bottom covers have to be removed since they hold the fan housing snaps down.
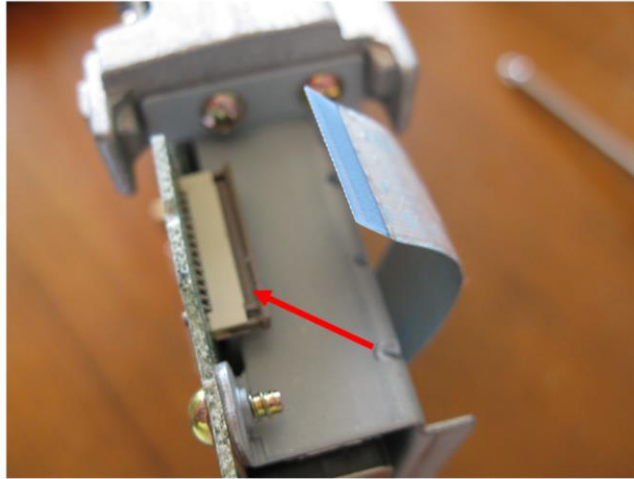
Test the fan

Test the fan by blowing on it or using a can of compressed air. It should spin freely. You might want to blow out the rest of the radio while you're at it.
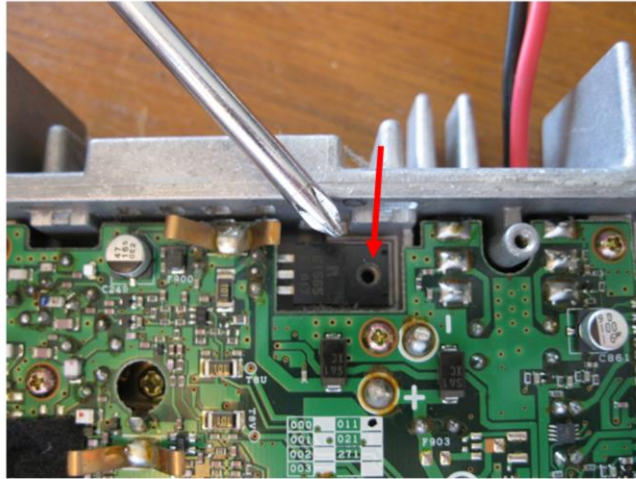
Power leads and grommet

The grommet also serves as a strain relief.

TNC ribbon cable

This type of ribbon cable is pinched by the connector. Pick up the dark brown part with your fingernail and the cable slips right out.
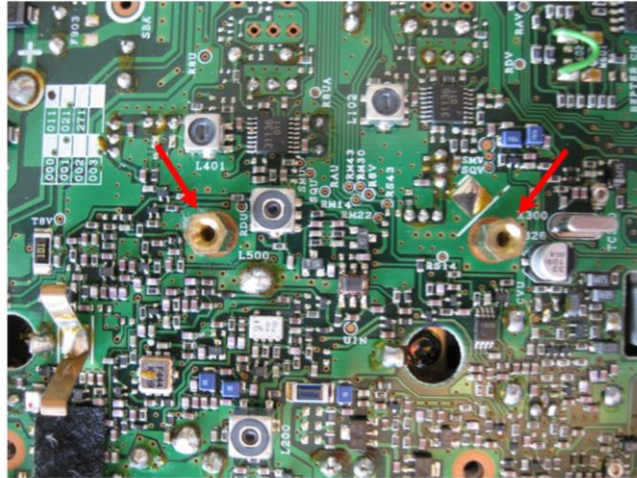
Remove the voltage regulator screw

This screw is more for structural support as the body of the VR is plastic and there's no thermal paste underneath the component. But probably also has some heat-sink function.

SO-239 antenna jack
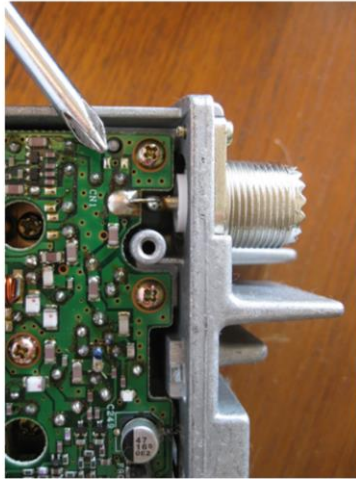
Note the jumper wire from the board to the center pin. This actually makes it easier to unsolder and resolder.

Remove screws & standoffs

There are 11 screws and 2 standoffs to remove before we can separate the TX-RX board from the massive structural heatsink. The two standoffs support the bottom cover. The standoffs are 5mm but a 3/16" nut driver will also work (4.76mm).
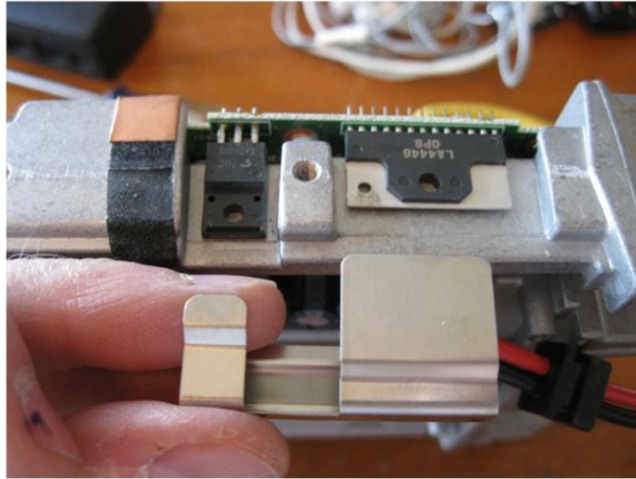
Power transistor screws
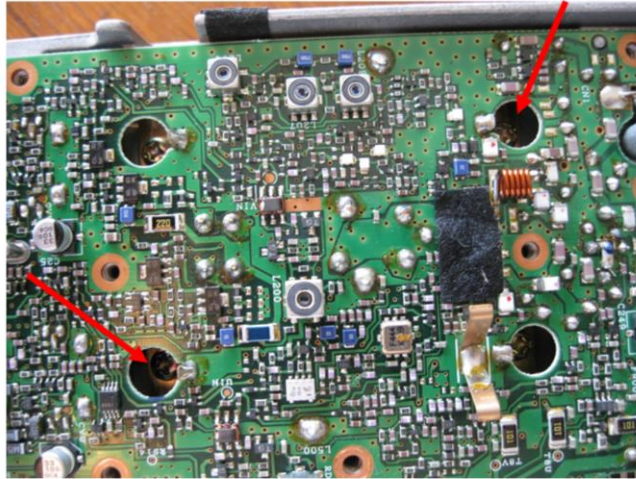
There is a screw inside each of these 4 holes. In pairs, they hold the two power transistors to the main heatsink.

Heatsink clip
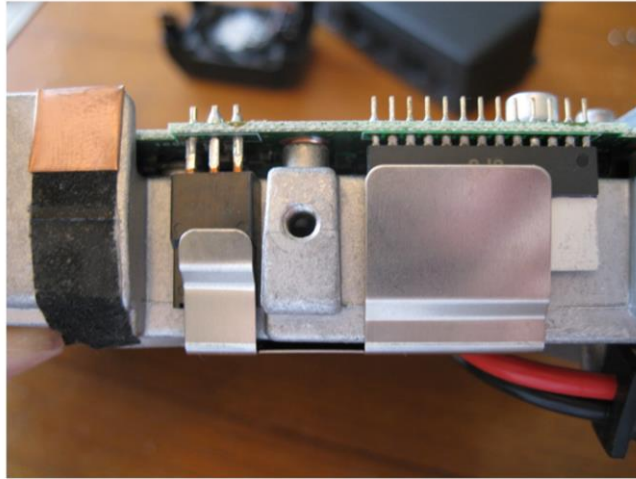
This clip holds two devices to the side of the heatsink. It slides off easily.
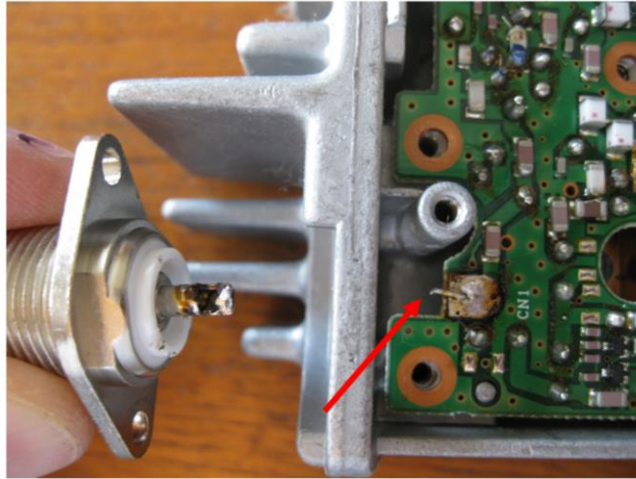
One of the easier steps!

How easy is this?

Soldering on the dining room table

This might be obvious to some but I should probably point out that your XYL might not appreciate solder splashes on the dining room table. This is from previous projects, not the current one. Be very sparing about hot solder around SMT components.

Removing the SO-239 jack

Clip the jumper, then unsolder the jumper pieces from the jack and board separately.
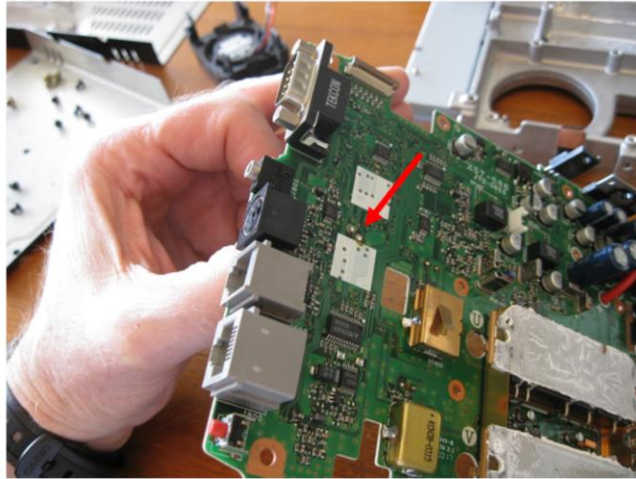
Separate the board from the heatsink

Note the thermal paste on the two power transistors. This improves heat transfer from the power transistors to the heatsink. Avoid getting this on the carpet or your clothes. Pretty much like the zinc oxide paste moms put on their baby's butt – doesn't wash out easily.
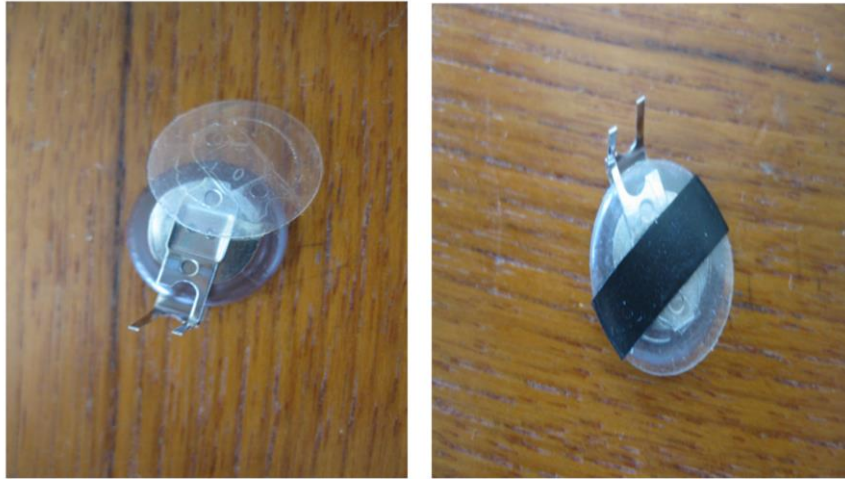
# Another view of the SO-239
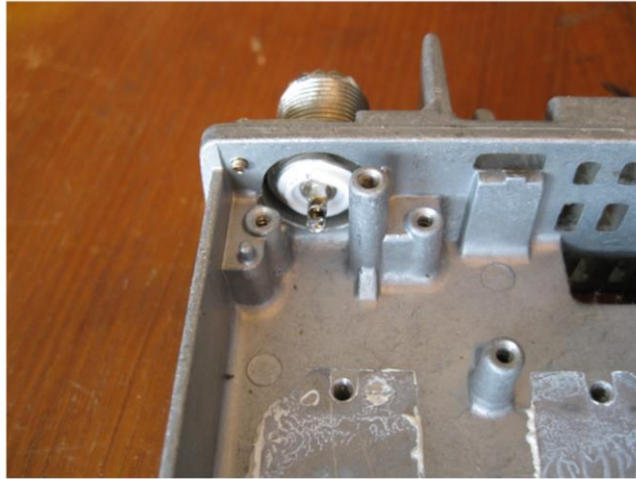
Desoldering the battery

Here I'm supporting the board with one hand while also holding the battery with my thumb and index finger. I've desoldered the holes with copper braid (capillary action) so the next touch of the iron will loosen the battery.

Battery insulator

Now the battery rests on an integrated circuit so as a precaution there's a plastic spacer between them. The adhesive is pretty weak after 15 years so I've cut a piece of electrical tape to hold it in place. Now's a reeeeally good time to break out your DVM and double-check that the battery voltage is at least 3 volts DC!

Battery mounting holes
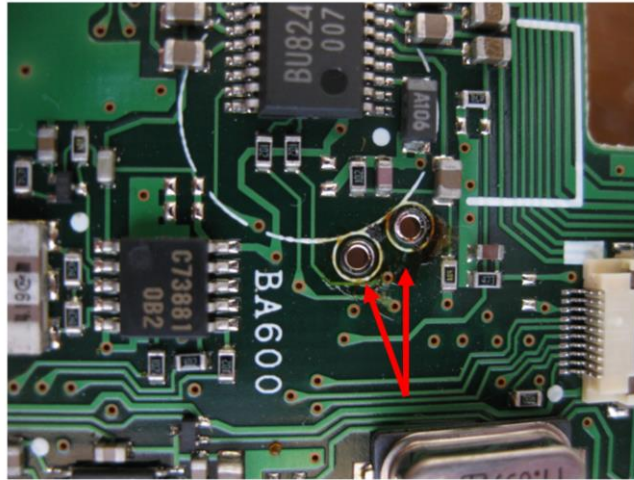
Note how close we are to other SMT components. A hot soldering iron actually minimizes component stress (provided you're quick about it).

My temporary assistant

The electrical tape is ugly but temporary. You want to hold the battery in a position so that the leads just barely stick through the other side. Commercial PCBs almost always have plate-through holes so it won't take much solder to tack these leads down.

The top of the board
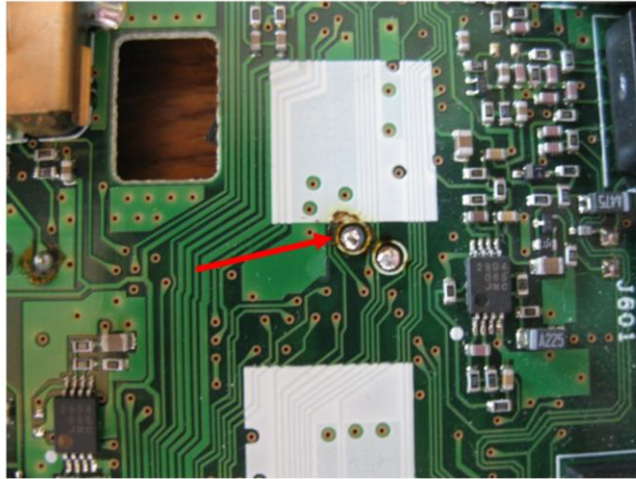
The battery is on the bottom of the board. Since these are plate-through holes we only have to fill them. No big blobs of solder that might bridge traces and cause unpleasant consequences. The brown stuff is resin flux. Scrape it off with your fingernail if you want.
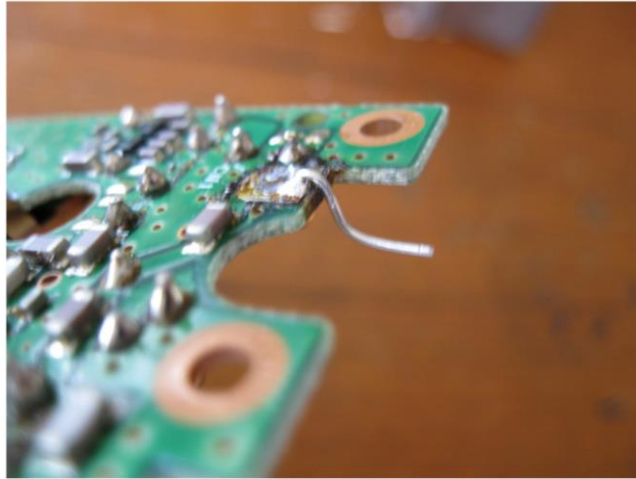
Done! Almost.

Now we have to put Humpty-Dumpty back together again.
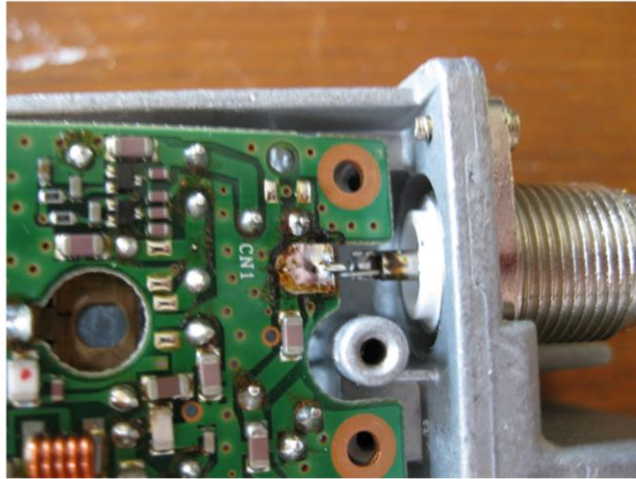
First attempt, start with the board

This will be the jumper to the antenna jack. A resistor lead makes a great jumper and the resistor itself absorbs a little heat. Gives you something to grab so you don't burn your fingers.

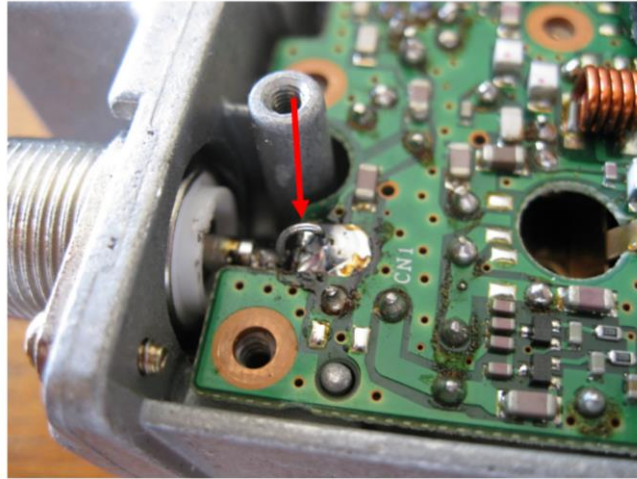# Just lower onto the SO-239 and…

Oops, can't quite get to it

Sadly there was not enough room to get my big Heathkit soldering iron tip onto the SO-239 terminal. So…

Attack it from the other direction

Same resistor, same technique. Also requires unsoldering the lead from the TX-RX board.

Bend the lead with needle-nosed pliers and push the jumper lead into the desoldered hole. Easy to solder now!
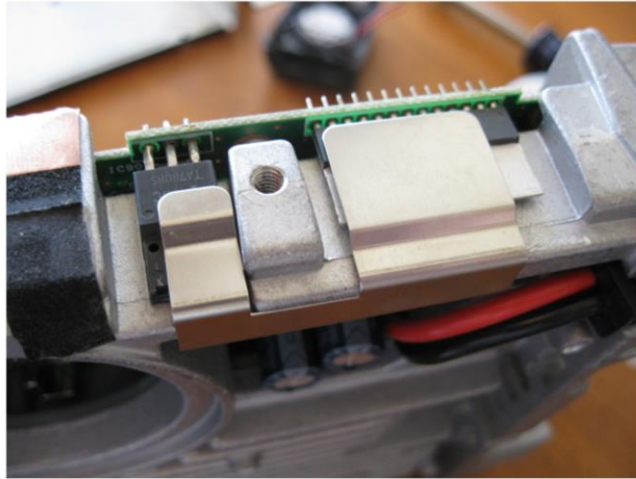
Magnetized screwdriver

Most screwdrivers are slightly magnetic after some use. If yours isn't magnetic you can wipe it on some electrical tape to make it slightly sticky. Carefully lower the 4 screws into the holes to secure the power transistors.
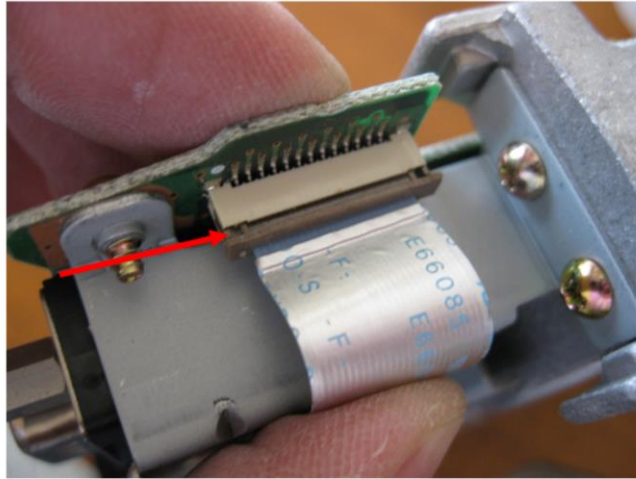
Reattach the TX-RX board
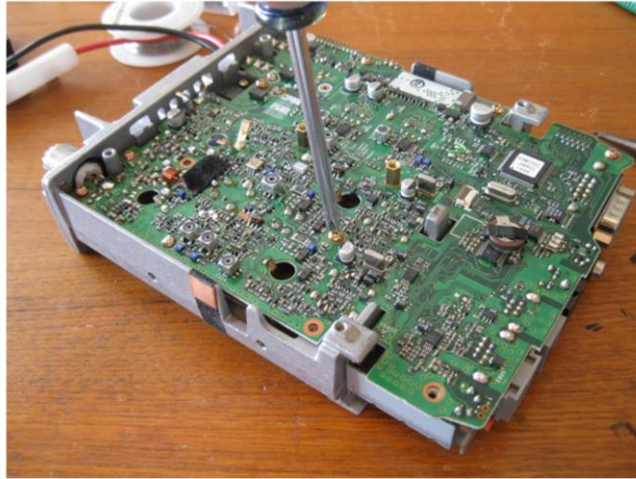
Snug down the 11 screws and the two 5mm standoffs.

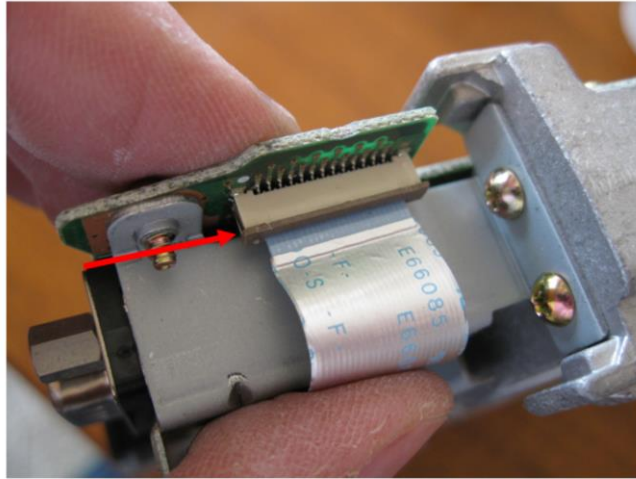# Heatsink clip goes back on

Reattach the TNC ribbon cable

Slide the ribbon cable in the slot and pinch to hold it. Note the slight gap between the tan part and the darker brown part of the connector. Then…

Reattach the TNC ribbon cable

Close the dark brown clamp with your fingernail. No more gap. **(toggle between slides)**

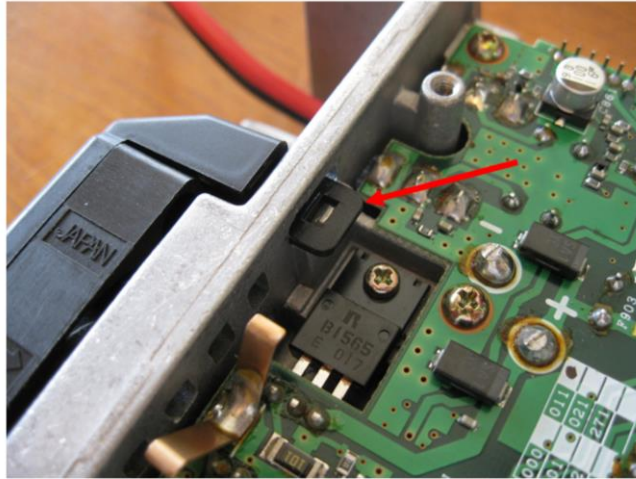Slide the front cover into place

This will cover the battery and snaps into place on the four corners. Be sure to check the alignment of the front connectors.

Reattach the fan power lead

This is a tight fit so you'll have to use a screwdriver or pen to push it down. You can't get your finger in there.

Attach the fan housing

The fan and its housing is reattached <u>before</u> reattaching either the top or bottom covers. Don't ask me how I know this. The two covers hold the four plastic snaps against the heatsink. Don't forget the voltage regulator screw.

Reattach the internal speaker

Position the rubber cushion ring <u>before</u> plugging in the speaker leads. Then the two covers go back on with the remaining 11 screws and you're done.

Success

Powers up so it appears that I didn't cook any components with my Heathkit iron. Reset the TNC's time and date at menu 1-6-3 and 1-6-4. I waited a couple of days to see if the date/time would hold and it did!

Cleanup time

Each time you use copper desoldering braid cut off the end piece that soaked up the solder. Don't try to be cheap here. You don't want any excess solder wicking onto the board.

That's all folks! Any questions? If you'd like a copy of this presentation, it's on my website www.n8ik.net