

Icom IC-781 (IC 781 IC781) filter modification

The stock FL-96 (455 kHz SSB: 2,8 kHz wide @ -6 dB) can be replaced with an FL-44A (2,4 kHz wide @ -6 dB) to improve adjacent-channel selectivity and sharpen Twin PBT operation. In addition, the stock FL-102 (9 MHz, AM) can be replaced with an FL-223 (9 MHz SSB: 1,9 kHz wide @ -6 dB) to provide an SSB-NARROW bandwidth setting.

Here is the filter installation procedure:

(I would suggest that you purchase an IC-781 service manual from Icom Parts for guidance, if you do not already have one. Icom Parts should also have the FL-44A).

1. Remove the top and bottom case covers.
2. Lay the radio upside down on a towel, with the front panel facing you.
3. Using a magnetic-tip manual screwdriver with a #2 Phillips tip having rounded blade edges, remove all eleven retaining screws from the IF board (the board with all the filters).
4. Unplug the multi-conductor header cables from the board, to allow the board to be moved aside.
5. Grab the inner edge of the board, and swing the board away from the chassis. Do not stress coax cables on board. Rest board on a stand (e.g. 2 phone books) next to radio.
6. Locate FL-96. Using a solder-sucker or wick, and a temperature-controlled pencil iron, desolder 4 filter pins.
7. Remove nuts & washers from filter mounting studs. (I think the nuts are M3 or M4.)
8. Remove FL-96, wiggling it gently to free pins. You may need to re-heat pins quickly to release filter. The board is G-10, and can take reasonable heat.
9. Place FL-44A on board; tighten down studs with nuts & washers.
10. Re-solder pins of FL-44A; clean excess flux with nylon brush & isopropyl alcohol. Also ensure that there are no solder blobs or slashes.
11. Re-install board and all cables unplugged in Step 4.
12. Pull FL-102; insert FL-223, and flip 2 dip switches (per user manual) from AM to SSB.
13. Test radio, then replace covers.

Good luck! The whole job should take about 30 minutes. Note that the FL-223 is selected in USB or LSB mode by pressing the [WIDE] button.

Icom IC-781 (IC 781 IC781) Reduce the internal heat by the speaker

If you remove the internal speaker, you can reduce the internal heat generated therein by quite a measure!

Icom IC-781 (IC 781 IC781) General coverage transmit mod

1. Remove power and ant.
2. Remove screws open case.
3. Locate and cut resistor r80 on logic b board.
4. Reset cpu.
5. Reassemble radio.

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Icom IC-781 (IC 781 IC781) ALC Circuit problem

The ALC circuit in the 781 is too slow to respond. This results in the following phenomenon: If you set the power level to 30W, for example, there is a leading pulse that can be more than 200W, particularly if the drive control is advanced. This results in a serious problem if you are using an amplifier. It makes it very difficult to limit drive to an amplifier properly.

This behavior is clearly seen on a scope and to some extent on a good peak-reading meter. However I suspect many hams are unaware of the problem as it does not show up on RMS meters due to the short duration of the spike.

I have used three 781's over the years (ser# 19??, 21?? and now 2589) and they all exhibit the same behavior. This behavior is not exhibited by other Icom radios I have checked such as the IC751A, IC735 or IC765.

When I had my previous 781, the tubes in my amplifier, a Ten-Tec Titan using a pair of 3CX800A7's, developed shorted grids, even though they were only a few years old and lightly used. I suspected the 781 caused the failure, but sold it before the amplifier was repaired. I recently bought another used 781 from Burghardt radio, serial # 2589, and within 3 weeks of obtaining the 781, my tubes (less than 2 years old) are shorted again. I do not believe this is a coincidence! I run the amp conservatively, and I doubt the tubes have 50 hours transmit time on them.

I believe the problem is vaporization of the gold plating from the grid of the 3CX800 causing the tubes to become gassy, which causes arcing.

I spoke to Technical Support at Icom USA and was informed that the 781's just work that way and nothing can be done. That is a ridiculous answer! Of course it can be fixed, the attack time in the ALC circuit has to be shortened.

This turned out to be easy to accomplish....

Locate the following components connected to the base of Q34 in the ALC amp, R107, R108, C47 & C48. These determine the attack and decay time of the ALC amp.

Values as per Service manual:

R107 1M
R108 100
C47 2.2uf
C48 .47uf

Values as per Production ser # 2589:

R107 1M
R108 100
C47 .47uf
C48 2.2uf

Note that C47 and C48 have been swapped... a step in the right direction.

Values that work:

R107 1M
R108 4.7K
C47 2.2uf
C48 .022uf - .1uf

.1 reduces the overshoot from 200%+ to 20%, .022 eliminates it almost completely. However, as the value of this capacitor is reduced, I'm concerned that IM products in the audio may start to increase due to syllabic compression of the RF envelope. I had no way to verify this.

Perhaps a project for a better equipped workshop! I would think .047 would be fine, though I'm using .022 without any noticeable degradation of audio quality.

Problem - Spurious signals

Here were the original symptoms: On some bands, even with a dummy load on the 781 I was seeing low level signal spikes on the spectrum scope. This was very noticeable on 40 meters. On some of the bands, I had problems with clusters of drifting and unstable signals, usually in an area 20-25 KHz wide. These were visible on the scope and were loud enough to cause problems with weak signals on 10 meters.

Solution

According to the FAQ in Icom America website, these problems are likely originated from faulty REG unit. Here's what I did:

1. Removed the regulator and resoldered EVERY solder spot on the board.

I don't recommend this unless you have magnifying glasses as the long leads sticking out the back of the board make it very easy to unintentionally bridge board traces. I did that, at it meant pulling the regulator board again when power wouldn't come up. As some of you know, this is as much fun as hitting yourself in the head with a hammer.

2. Reformed the 2 grounding fingers on the back side of the regulator board to ensure that they were properly contacting the housing when the regulator board is in place. I think this was the principle fix, as the finger nearest the .001 ohm resistive link was definitely NOT contacting the housing. This finger had been removed and reinstalled when I did the original regulator repair and I just neglected to reform it to the proper position.

3. Cleaned the two grounding fingers and their contact points with De-Oxit. Also cleaned all other grounding fingers I could find near the top rear of the 781.

4. At each corner of the regulator board where the mounting screws are, there's a ring of small dots around the screw on the back side of the board that are apparently designed to ground the board well to the screw stud in the casting. That's necessary since it's practically impossible to get a lock washer into those places. I sweated a tiny blob of solder on each of the dots so as to make good contact with the stud. There was little or no solder on many of the dots and whether or not there was any ground at that point was questionable.

So, after all that, when I look at any of the bands with a dummy load on the 781, I no longer see any low level signals on the scope at all. On ten meters, all of the spurious signals appear to be gone. With no antenna connected, I still see some very low level blips on the spectrum scope, but only with the preamp on.

Hints – how to take out the REG Unit from the chassis

In the past, I've removed everything from the regulator compartment, including the DI Unit (see 5-12 and 5-13 for hardware layout in the service manual) , which is just a pair of diodes in what appears to be a TO-5 housing (but may be larger?) and the TR Unit. The TR Unit is a pair of large transistors mounted above the DI Unit. I also just unsoldered the smaller wires from the regulator board as they have pins on the end and that seemed the easier way to go.

I now think it's easier and less risky to leave the DI Unit and TR Unit secured to the casting and just unsolder the cap and 2 wires that go to the TR Unit and the three large wires that go to the DI Unit.

Instead of unsoldering the wires that run from the regulator board to the power supply unit (PI board), I removed the scope module, pulled the lid from the PI unit, and unplugged the 4 connectors for those wires.

You have to remove the 4 screws holding the RF and Filter units to the side rails and lift it a bit on the left side (facing the rear of the 781). The wire bundle is secured to the left panel (again, facing the rear) by two soft metal fingers that are bent around the wires. You can pull those back with some sort of hooked tool and free the wires.

At that point, you're ready to pull the connectors through the slot at the top left of the regulator board after you've removed all the

regulator board mounting screws. Don't forget the (4) screws securing the regulator ICs to the heat compartment wall. One of the screws securing the board is actually one of the mounting studs for the TR Unit. Only one of the ICs I mentioned uses a mica insulator and looks like that's actually a package of 2 diodes (D2) and not a regulator. Make sure to clean the ICs and their mounting positions on the compartment wall of heat sink compound and don't forget to use new compound when reinstalling!

There are two large surface mount bypass caps C14 and C19 on the rear of the regulator board and the two grounding fingers are soldered to the ground side of those capacitors. Make sure you pull the fingers out a ways to ensure that they make good contact with the compartment wall when reinstalled.

The component leads on the regulator board are extraordinarily long and so it's very easy to create a solder bridge when reheating the soldered holes. Having some solder wick handy is a good idea for removing any bridges you create.

Take care when unsoldering and soldering the three heavy leads from the regulator board to the DI board. It takes a bit of heat to free them and I'm not sure how many times you can go through that process before the copper might separate from the D1 board. I use a WTCPT iron with a 700 degree tip and apply the heat to the wire and not the trace. Those wires are just tacked to the board and not mechanically secured except by the solder, so take care when reinstalling them to make sure you have a good joint.

Take care when reinstalling the screws in the regulator compartment. If you get one cross-threaded, then you have a real problem as the threads will strip very easily in the soft aluminum. Dealing with that is a real, hair-puller (voice of experience!).

When reinstalling the RF and Filter units, make sure all the fingers make good contact with the modules and clean the contact points with De-Oxit or something similar first.

For someone who has never removed the scope module, you'll need an unusually long Phillips screw driver to get to two of the screws. The module is easier to pull out if you first pop off the top shield, giving you something to hold on to.

When replacing the two larger connectors at the PI board from the regulator, use something like a wide jaw vise grip to force the connectors together. I had a problem getting one of them seated properly without the tool.

If you have any problems after reinstalling everything, the Service Manual page 6-40 and 6-41 show you where to check the various voltages on the PI Unit coming from the regulator, and that can help determine where to look for the problem.

As always, be very careful!

73, K8AC

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