

IC-706 Modifications & Fixes



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FM Transmit Fix

(This article appeared in "Six News" Issue 59 and "Radio & Communications" April 1999)

Is your 706 not transmitting on FM properly? This maybe why...

Having taken my Icom IC-706 back for service twice before for the same fault, I was not prepared to be inconvenienced a third time! As it turns out IC-706s all over the World have been exhibiting the same fault. I've had e-mail from other unhappy IC-706 owners as far away as the U.S.A. and the U.K.

Upon checking the previous Fault Reports I noticed that the FM VCO had been tweaked.

Hmmm... There is a 9MHz VCO used during FM mode only which is modulated from the mic amp.

Fault condition symptoms are;

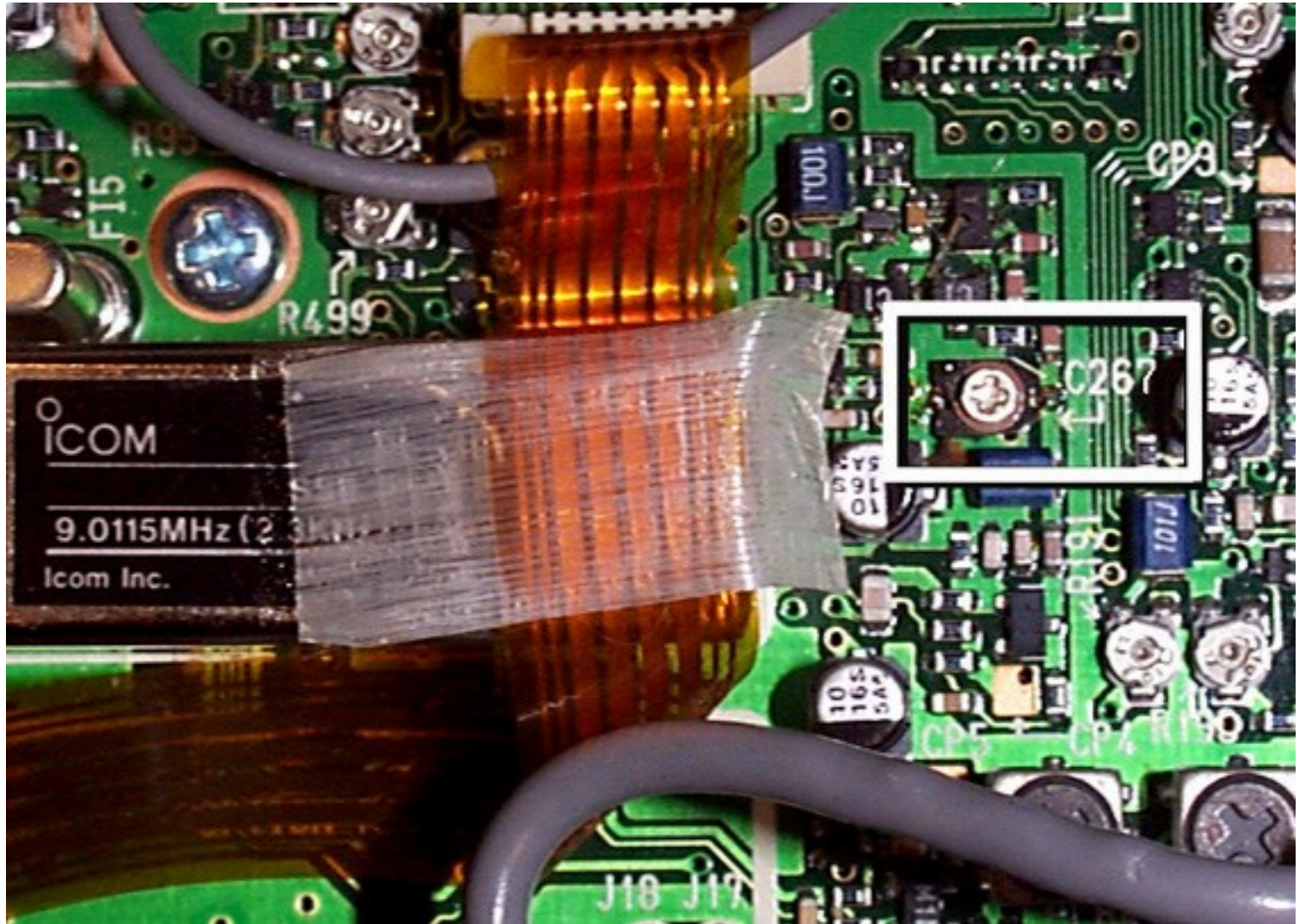
- Very low Output power (enough to be heard on a nearby receiver on the shack bench but that's about it).
- Carrier frequency is NOT what the dial indicates, typically 5 - 30kHz on the low side.
- Carrier tends to wander and sounds spurious.

The culprit

I discovered that C267 a miniature SMT trimmer capacitor located 9mm to the right of the 9.0115 MHz IF Filter on the Main Unit - refer to picture - was not re-flow soldered to the PCB to a satisfactory standard. ie; There was insufficient solder paste applied during the printing process and the end result being a poor solder joint and an intermittent 9MHz VCO.

After re-touching both pins of C267 with fresh solder it's performed faultlessly since.

Although access to the offending area is easy you will need a very fine tip on your iron to get to the trimmer pin on the filter side without damaging the capacitor itself and disturbing two nearby 0603 chip capacitors. I cannot stress enough to successfully carry this repair out you need a very very fine tipped soldering iron, and ensure the tip is in good order.



Equipment Required

You'll require the following tools;

- Small Phillips-head screwdriver.
- Accurate Frequency Counter. (Another receiver will do).
- Dummy Load, Power Meter & coax patch leads.
- Soldering iron with very fine tip
- Fine solder 0.7 or 0.5mm.
- De-solder wick if required.
- NEVER EVER use a plunger type solder sucker on SMT boards - The re-coil action can damage boards and parts.

Procedure;

1. Turn transceiver off and disconnect all leads. (Obvious?)
2. Using a Phillips-head driver remove top cover only.
3. With radio upright & front facing towards you (ie; normal operating position) the MAIN Unit PBA is the front board.
4. Locate the 9.0115 MHz IF filter and then C267 (identified on silkscreen) 9mm to the right of the filter.
5. Using fresh solder, carefully re-touch up solder joints to both pins of the trimmer cap. The filter side is difficult to solder due to nearby capacitors and the fact that the ground plane will sink a lot of heat. This is the pin that is usually not soldered properly ex the factory.
6. Inspect solder joints carefully, particularly the ground plane side.
7. Connect Dummy Load via a PWR meter.
8. Turn the transceiver on, select FM mode, and select a convenient test frequency, ie; 29.6MHz.
9. Confirm TX carrier frequency is correct against Frequency Counter (or another receiver).
10. Check Power O/P is appropriate to the PWR setting in the menu.
11. If all ok, turn off and replace the top cover. It is most unlikely you will need to tweak C267. The setting should still be correct, otherwise alignment is not that critical, just set it for centre of lock range.

Needless to say, any work performed on your transceiver other than by an authorised Icom service agent may void your warranty, if that is still applicable.

See you on 29.6MHz FM!



Deaf on 2MX fix

A friends 706 was completely deaf on 2MX, and gee what a surprise, when we discovered that is was due to poor soldering!

I never documented this properly, but there were 2 SMT inductors on the Front end board (just near the Power connector) that had lifted on one end only from the PCB (due to vibrations introduced from mobile operation).

Just re-touch these solder joints up.



IC-706 General Coverage Transmit Modification

Tools required:

- Philips head screwdriver
- 10 - 15 watt soldering iron with fine tip

- Magnifying glass
- Tweezers

Procedure:

1. Remove the TOP cover by removing three philips head screws on the top and one on each side.
2. Move the speaker bracket out of the way.
3. Locate D-59, this is a three terminal SMD diode in an SOT package, about 1 x 3 mm (with the radio front panel oriented towards you. D-59 is located in a row of SMD diodes just to the right of the ribbon cable header above the 9 MHz SSB filter FL-30.
4. There are pads for 5 diodes with only three installed. D-59 is the second from the left).
5. Using tweezers and a low-wattage soldering iron (and magnifying glass, if necessary) remove D-59 by applying some heat to the single leg side of the device while lifting gently, then apply heat to the other two legs and removing the device.
6. Be careful not to apply too much heat, not to rip or burn any traces or not to leave excess solder on the PCB.
7. Replace the speaker bracket and top cover.
8. Apply power and reset the microprocessor (Power on + DN + UP).

TX = 1.6 MHz - 54.00 MHz

Don't transmit where you shouldn't, blah blah blah...



IC-706 Analogue Band Data Table

Connector: ACC(2) - Pin 4

Handy if you are building an external comparator for antenna switching.

Band Start	Band End	Volts
00.030.00	1.999.99	7.55
02.000.00	3.999.99	6.18
04.000.00	7.999.99	5.17
08.000.00	10.999.99	0.05

11.000.00	14.999.99	4.15
15.000.00	21.999.99	3.26
22.000.00	30.000.00	2.29
30.000.00	60.000.00	1.26

Measurements taken with Micronta 22-195 Benchtop auto-ranging Multimeter. 10M I/P Z.



Microphone Audio Response Improvement

This mod was submitted by Pete PE1MHO

- CAREFULLY open the microphone. (There's a little spring in there that will fly out and get lost in the carpet, never to appear again.)
- Remove the circular metal plate that holds the electret capsule in place, and GENTLY pull out the capsule.
- You'll find what can best be described as a "Q" shaped rubber gasket - remove this and throw it away.
- Reassemble everything - that's all there is to it!

You will now have a microphone with a bit more punch, but most importantly the audio bandpass is a lot better. The difference as measured on an audio spectrum analyzer was quite significant. I'm not sure if this helps for the Mk II and Mk IIG - maybe Icom have already adapted them....



Receiver Sensitivity

This fix was submitted by David, VK4GL.

Check RL1 on the filter board.

Watch RL1 as is power cycled on/off. The relay has a clear case.

This is a Tx / Rx relay for switching the antenna from the RX input to the PA output. If Q1 driver transistor is short, the relay is held ON, so the receiver is almost stone-deaf. The antenna is connected to the PA all the time.



RF Output On 1 Band Only & Low On Others.

This fix was submitted by David, VK4GL.

This can be caused by a blown relay Driver transistor on the the FILTER board.

There are a set of band-pass filters switched by input/output relay pairs.

If one of the relays stays closed, then two filters are effectively in parallel, so the filter tuning is stuffed, and the PA doesn't see the correct load.

Check by measuring the relay drive power as the receiver is tuned. (Set the dial tuning steps to 100 KC for ease of tuning.)

Measure the drive change on each relay coil at the appropriate frequency transisiton.

The switch points for changeover of the filters are:

Frequency	Drive Line	Relay Pair
0 - 2Mhz	L1	RL14 & RL15
2 - 4MHz	L2	RL12 & RL13
4 - 8MHz	L3	RL4 & RL5
8 - 15MHz	L4	RL8 & RL9
15 - 22MHz	L5	RL10 & RL11
22 - 30MHz	L6	RL6 & RL7
30 - 60MHz	L5	RL2 & RL3

The problems in both cases had probably been caused by RF leakage on transmit across the PCB due to salt. The rig had been used in the tropics on an island in a past life. There was corrosion on some of the tip-plate shields etc.

