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# Poor Grounding in FT 991A Tuner Unit

[Jump to bottom](#)

Rodrigo Freire edited this page on Dec 28, 2020 · 15 revisions

## Grounding issues in Tuner Unit causes high SWR warning after tuning

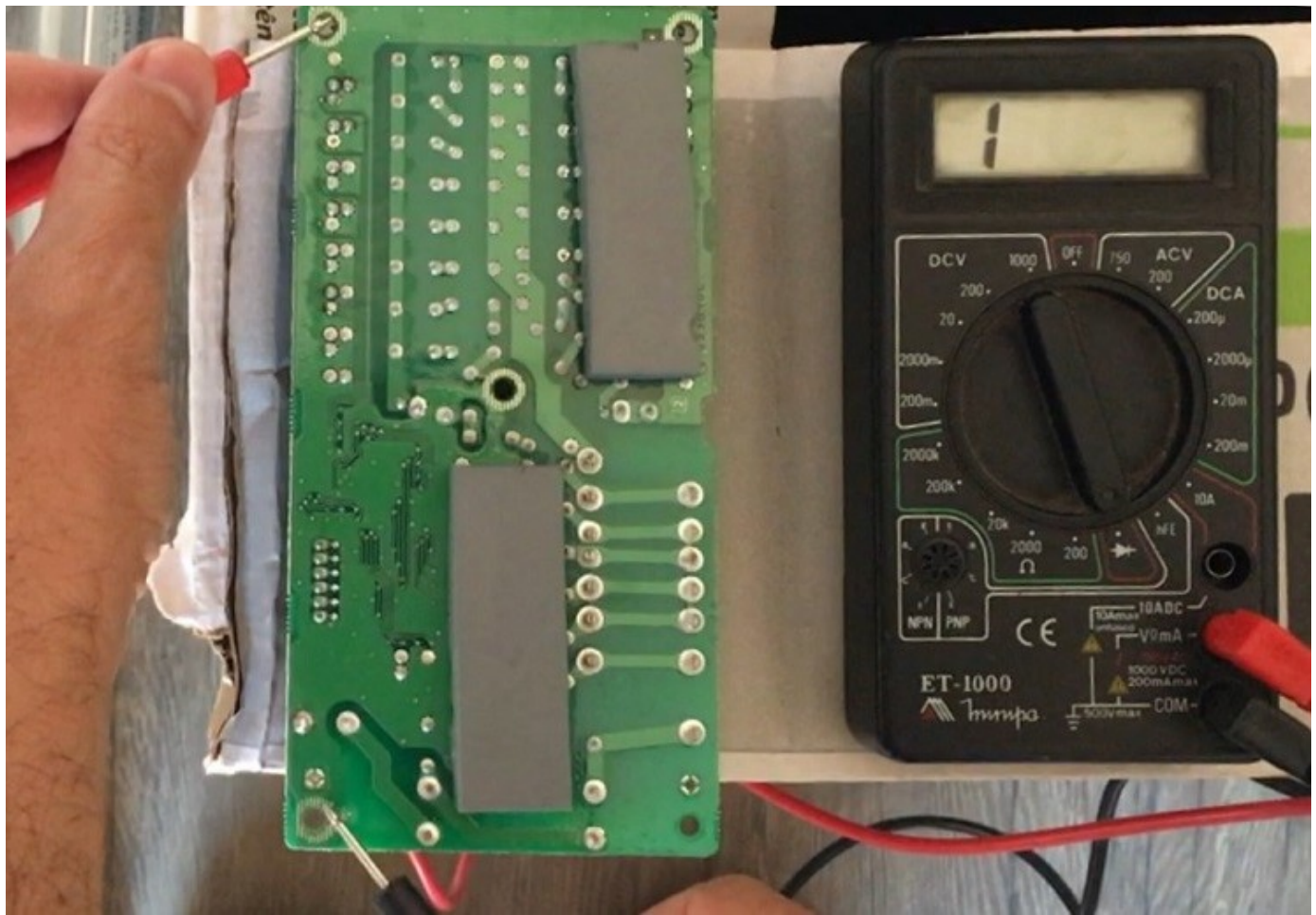
After using your Internal Tuner to tune in 7 MHz and lower bands (also happening in 20 and 15m to as per [report](#)), the radio may tune it - but when you transmit, you are presented the HI-SWR warning - with VSWR tending to infinite.

This happens because the FT-991/A (and potentially the non-A models) has a grounding issue in the Tuner Unit.

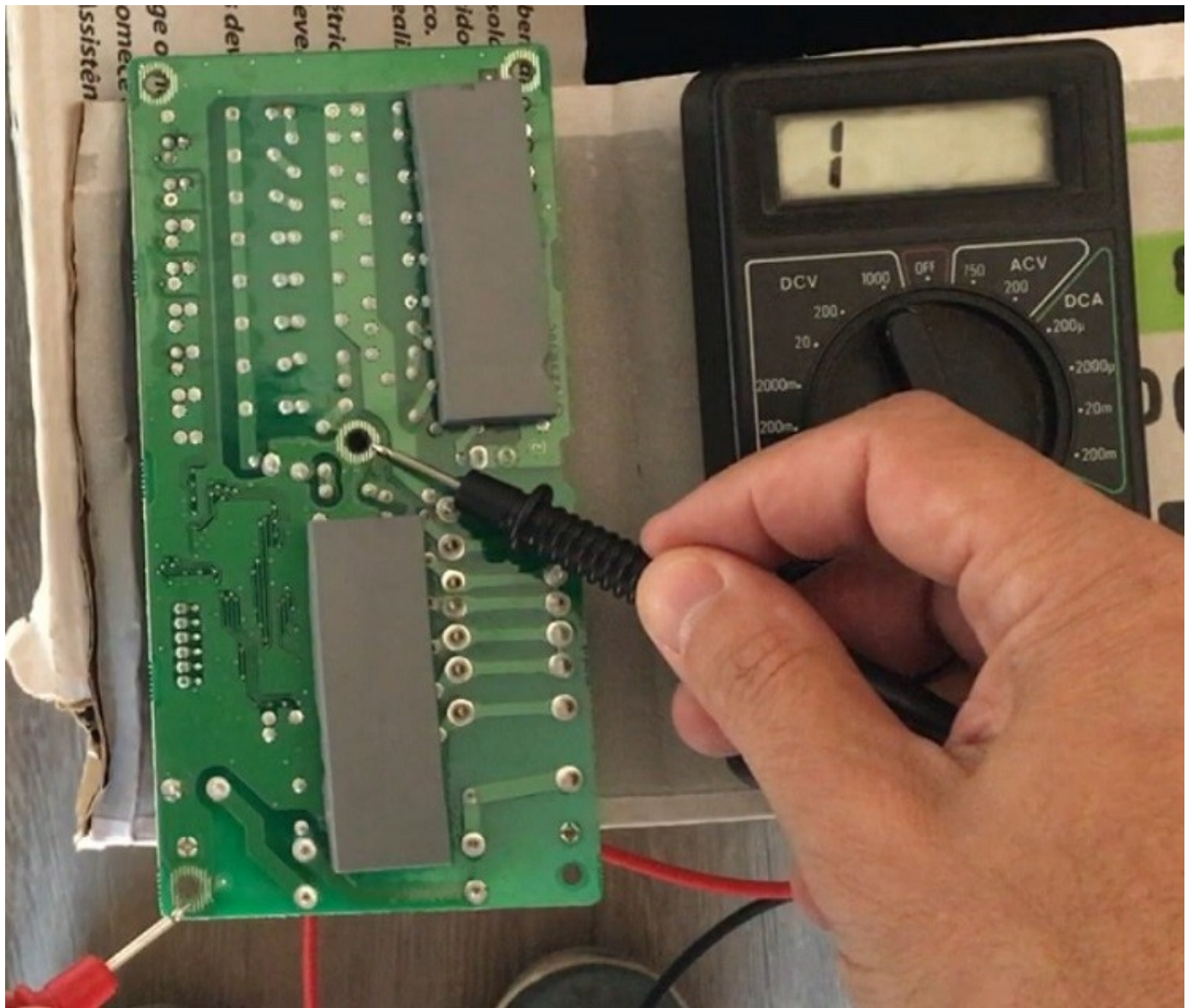
I have seen [floating over the internet](#) a few articles mentioning this issue - this is because the solder contact points at the bottom of the tuner unit are bathed with varnish/lacquer/solder mask.

Initially I was skeptical of it - this looked like something too stupid and hey, mine is a 2018 FT-991A! - until the day I needed to do a test in 7.290, a tad higher in 40m band and with higher VSWR and used the radio tuner. As soon I hit the PTT the HI SWR started flashing - and I went to investigate.

To my shock, it was indeed the case - at the bottom side of the board, the "soldered" contacts that are supposed to provide a better contact with the chassis, are all **covered by some kind of varnish/lacquer!**



*Continuity test 1 - No continuity*



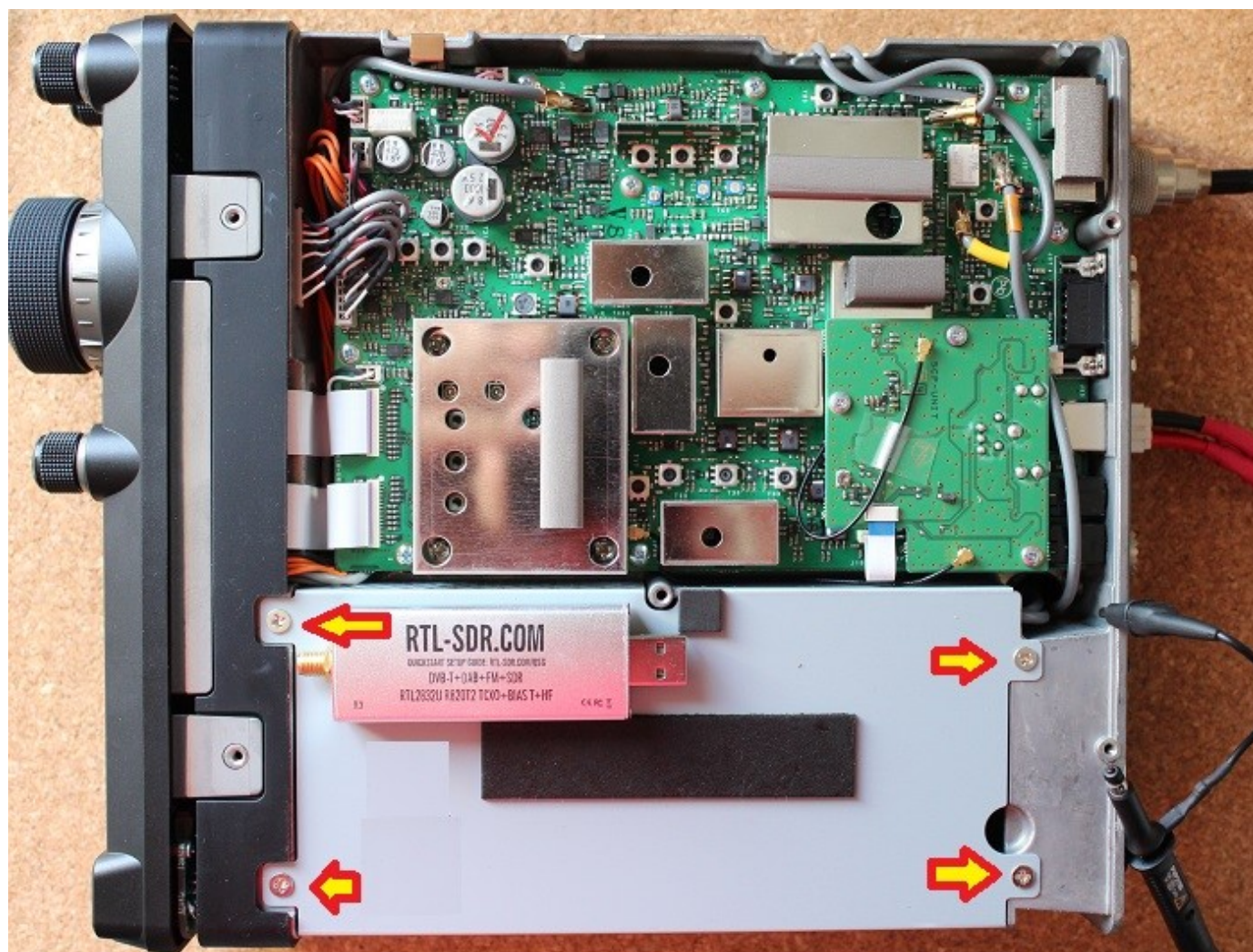
*Continuity test 2 - Trying other contacts. No continuity too.*

## Fixing it

Estimated time: 30-45 minutes.

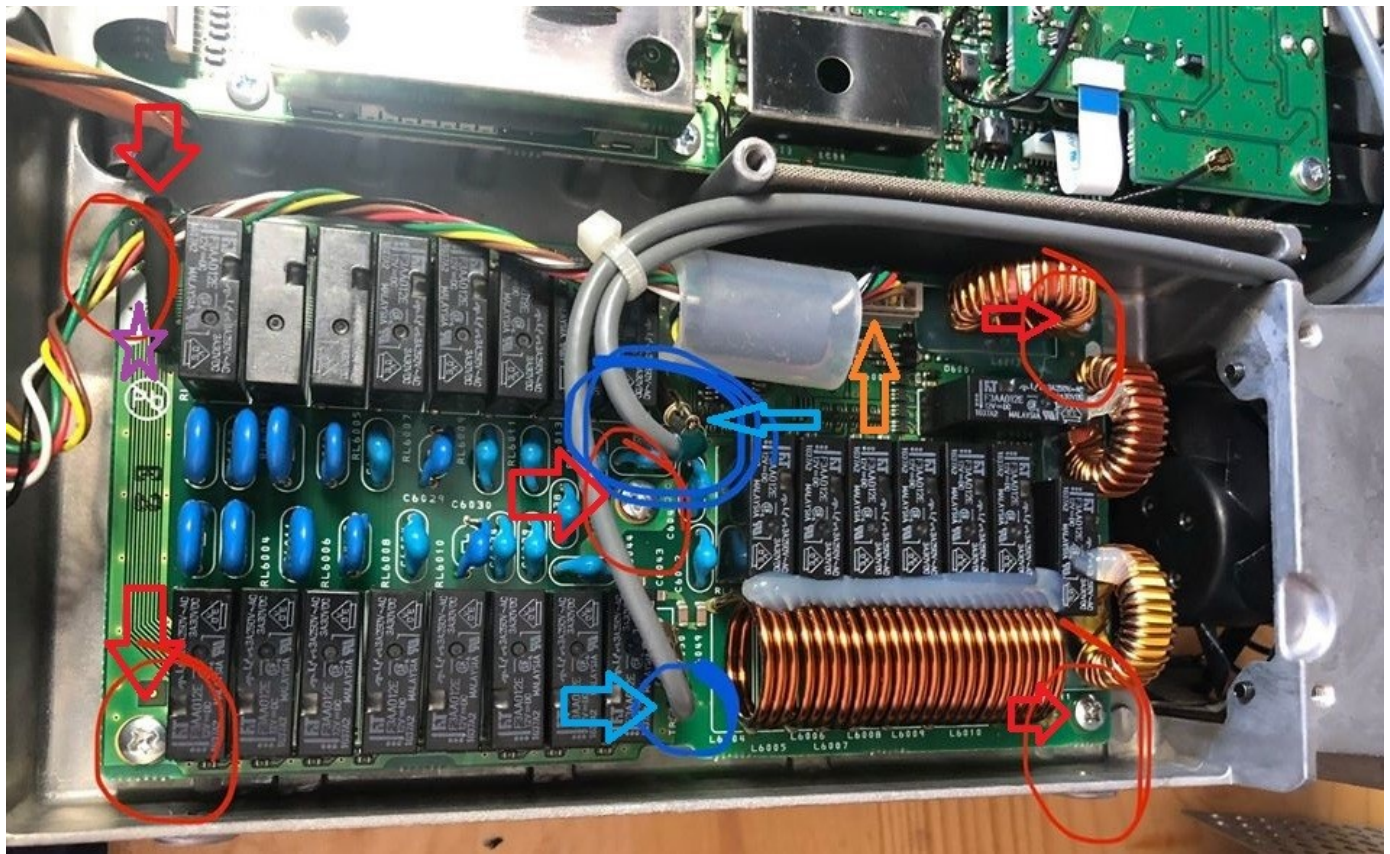
Removing the Tuner Unit is pretty straightforward.

1. Remove the side strap
2. Remove the bottom cover
3. The Tuner Unit is covered by a metal cover. Remove the four screws holding the metal cover and open it. Disregard the RTL-SDR in the picture, heh.



### *Tuner Unit screws*

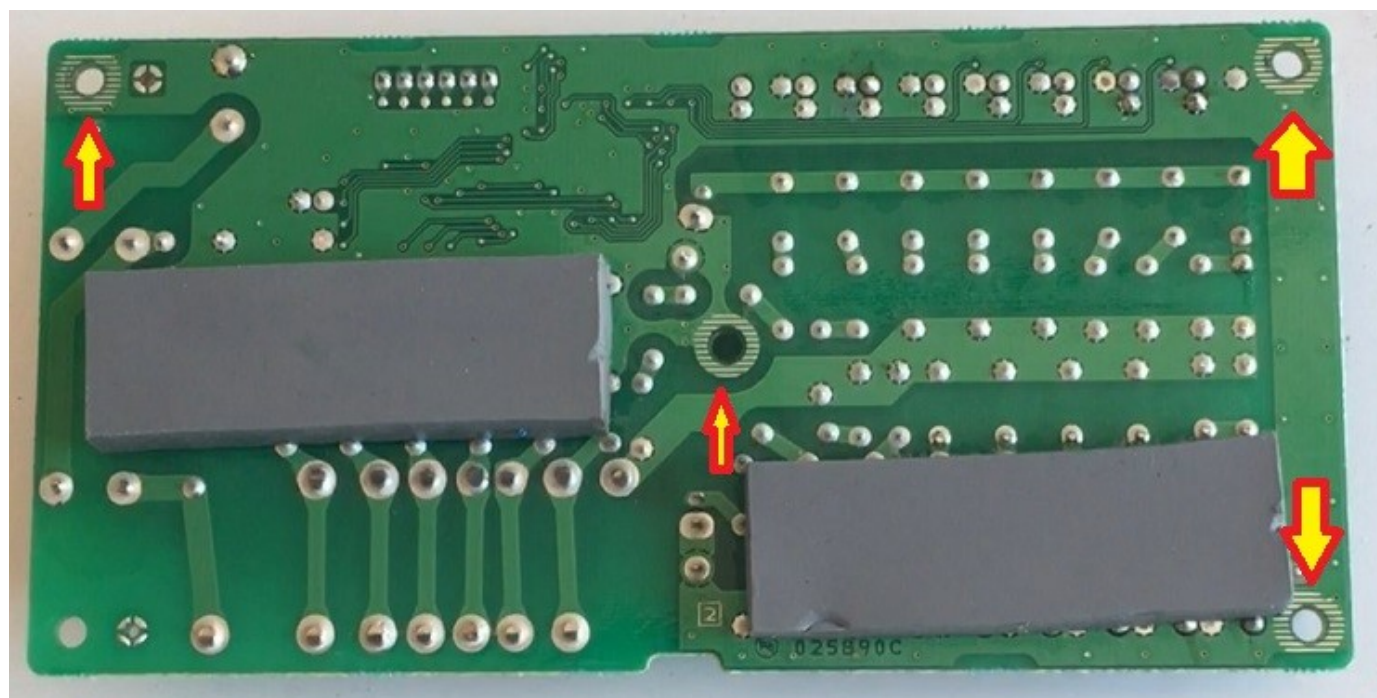
4. Carefully remove the control cable (orange arrow). Remember the lid holding it (violet star, upper left side)
5. Carefully remove the two coax cables (blue arrows)
6. Remove the screws that attaches the tuner unit (red arrows)



*Tuner unit removal. Image credits: Waruna Illukpitiya, 4S6WLX*

7. **Extra Carefully** remove the tuner unit by tilting it - there are thermal pads between the board and the chassis - and they stick. Move the board to unstuck it and remove from the radio.
8. Notice the position of the three thermal pads - they are exactly under the three relay banks.

After removing, check the flip side:

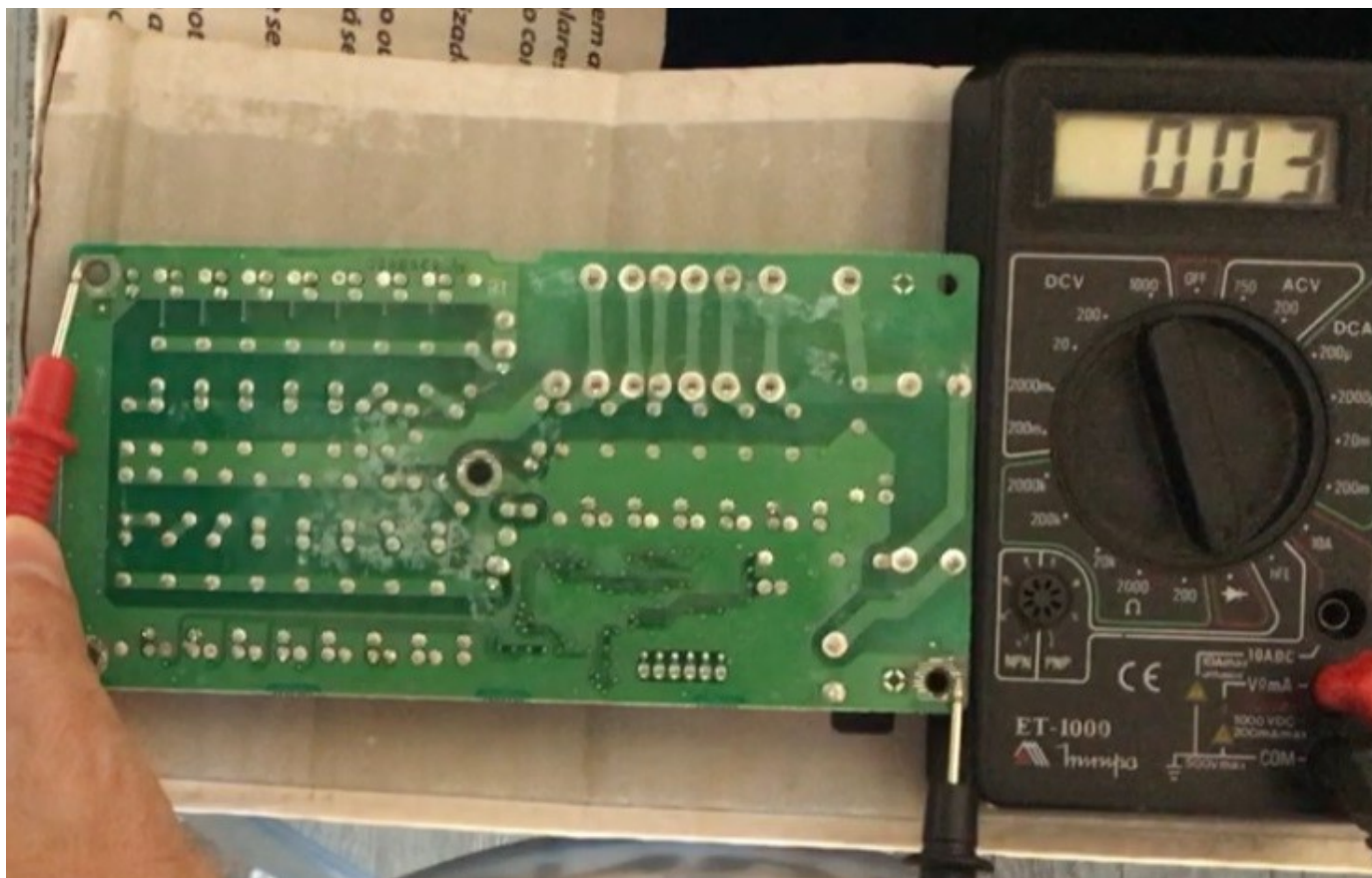


*FT-991A Tuner Unit - Bottom side. Arrow points the ground connections to the chassis*

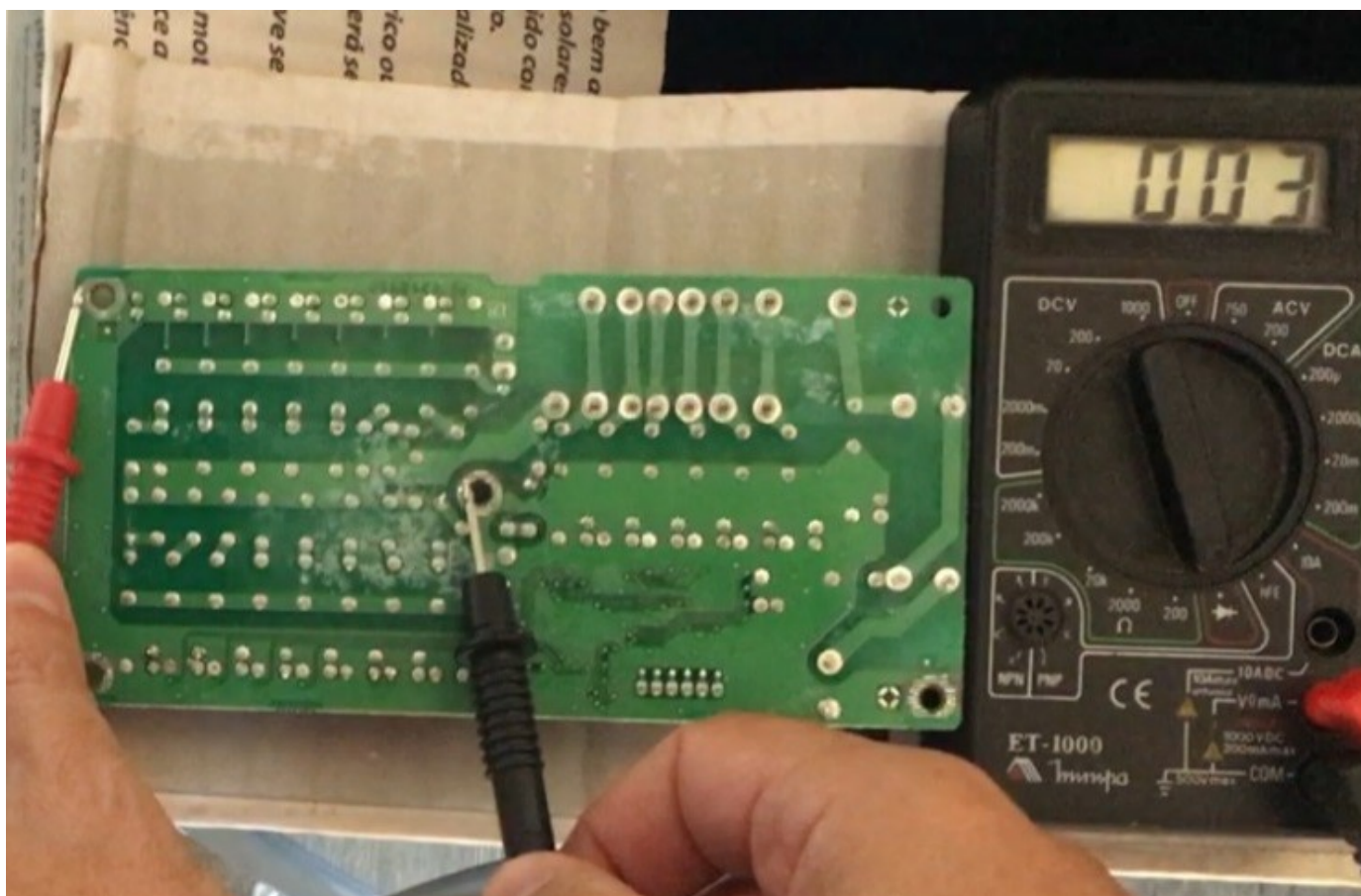
Do the continuity tests on *all four* ground connections. If yours has no solder mask in any of them, reassemble your equipment. Otherwise... Keep reading.

This lacquer is *hard* to remove - I did not have isopropyl alcohol, don't know if is it effective to dilute it - So I removed it using a sharp and delicate knife, and gently removing the lacquer from the contacts, on all four contact points.

After you got **good connectivity** on **all four screw contacts**, clean the area with alcohol, remove any residue and reposition the thermal pads *under the relay bank*.



Continuity test - test 1



## Continuity test - test 2

Take the opportunity to clear with alcohol the contact point **in the chassis** where you will screw the Tuner Unit.

Reassemble the tuner unit, don't forget to reconnect the Control Cable, the Lid and the two coaxial cables. Ensure to give a good (not excessive) torque on the screws.

Close the equipment and that's it.

## Why did this cause the failure?

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- But what about the screw? It has a copper ground pad in the board upper side that makes contact with the screw and it is attached to the chassis - that should be enough to conduct the energy right?

Well - technically yes. The board is grounded to the chassis: However, it uses two different contacts: The board makes contact with the screw, and the screw with the chassis. And this is good enough for DC power. But remember, we are talking about Radio Frequency grounding. Keep reading.

Now another think exercise: The RF signal that comes from the **bottom side** of the board and needs to go to the ground: It comes from the component lead, enters the track - and the track does not make any direct contact to the chassis - so the signal have to emerge to the upper side of the board through a (very small) via, enter the upper side track, flow to the screw - which finally gets contact with the chassis and is drained.

Far from optimal.

## FT-DX101D / FT-DX101MP

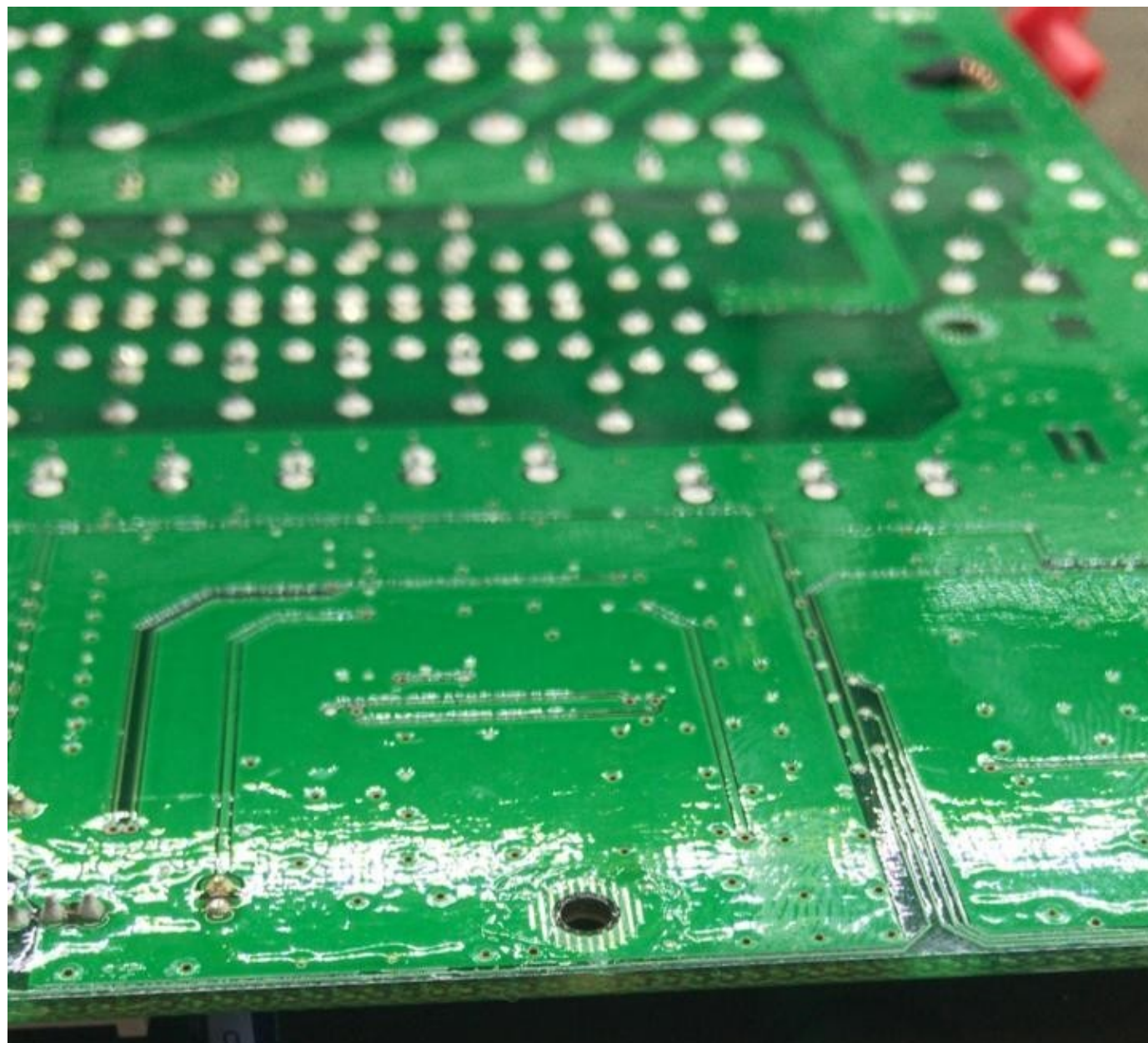
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To my absolute surprise and astonishment, the brand new FT-DX101D / FT-DX101MP are **also affected** by this same issue - How can it be possible an \$3k radio ship with such overlook!

Yvo Muniz from [Alpha Telecom](#) was [repairing an FT-DX101D that had an PCB holed out due to electrical discharge](#). In 101D, it happens that the RF connectors goes out in the Tuner Unit board. So in order to repair the board he went to examine against the existence of solder mask / varnish in solder pads.

Well - it was true. See the pictures for yourself.





*FT-DX101D Tuner Unit - Poor grounding in Tuner Unit - Ground pads covered by varnish/lacquer.*

Image: Yvo Muniz, [Alpha Telecom](#)

▼ Pages 22

[Home](#)

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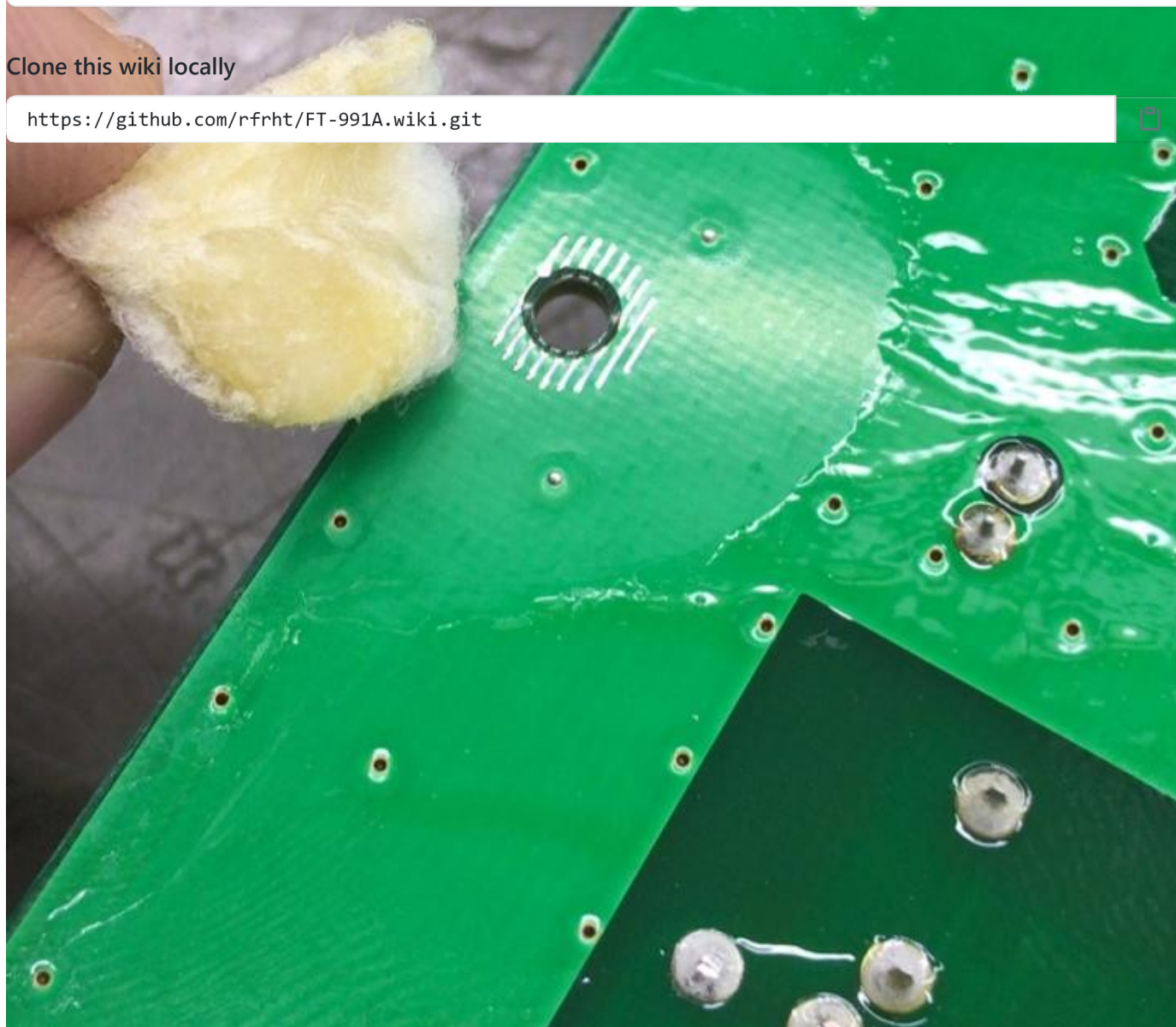
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*FT-DX101D Tuner Unit - Poor grounding in Tuner Unit - Removing varnish/lacquer from grounding pads.*

*Image: Yvo Muniz, [Alpha Telecom](#)*

So I would strongly recommend checking your brand new equipment, as well your 991/991A too - seems to be a poor manufacturing/QA/QE issue.

Hope that helps; 73 de PY2RAF.

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[Back to Home](#)

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