RFzero ICOM IC-9700 Coupler Board

The ICOM IC-9700 is a good radio for working DX on 2 m, 70 cm and 23 cm. However, the frequency stability could be a lot better, especially when using it for digital modes. With the RFzero™ IC-9700 coupler board you can lock the radio to the GPS satellites. This improves both the stability and the frequency accuracy.

Please read this guide carefully before the installation, and be aware that the installation may void the warranty of your IC-9700.

Description

The RFzero provides the 49,152 MHz signal when running the IC-9700 program. The signal is then coupled into the IC-9700, where it substitutes the original and unlocked local oscillator signal.

The installation is not difficult, but it does require some attention to details. The total installation and setup takes less than 30 minutes.

The coupler board cannot be used to lock your IC-9700 to a 10 MHz reference signal.

Tools needed

To perform the installation you will need the following tools

- Screwdriver, Japanese Industrial Standard JIS2, alternatively Philips Head PH2
- Spanner, fixed 8 mm, 5/16” or adjustable
- Soldering iron, 20 W to 25 W, and solder

You also need an SMA-SMA cable between your IC-9700 and RFzero. This cable is not supplied as the length is unique from shack to shack.

Installation

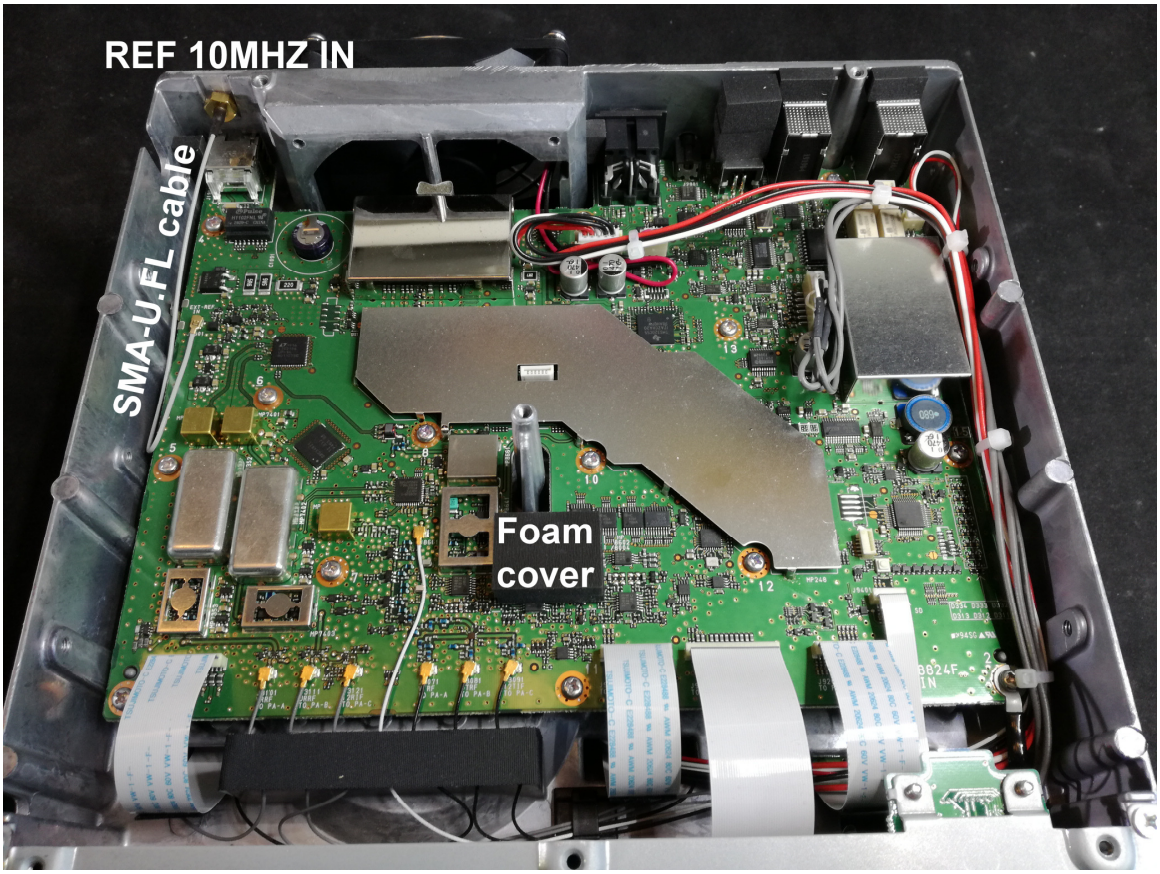
To perform the installation please carry out the steps below

1. Don’t wear synthetic clothes and shoes. They may build-up a static charge that could damage your radio

2. Unplug the IC-9700 from all the cables
3. If you don’t have an antistatic workbench please discharge yourself touching a ground connection
4. To avoid any scratches to the radio place it on an antistatic and clean mat. If you don’t have such a mat available, you may use a cotton towel instead

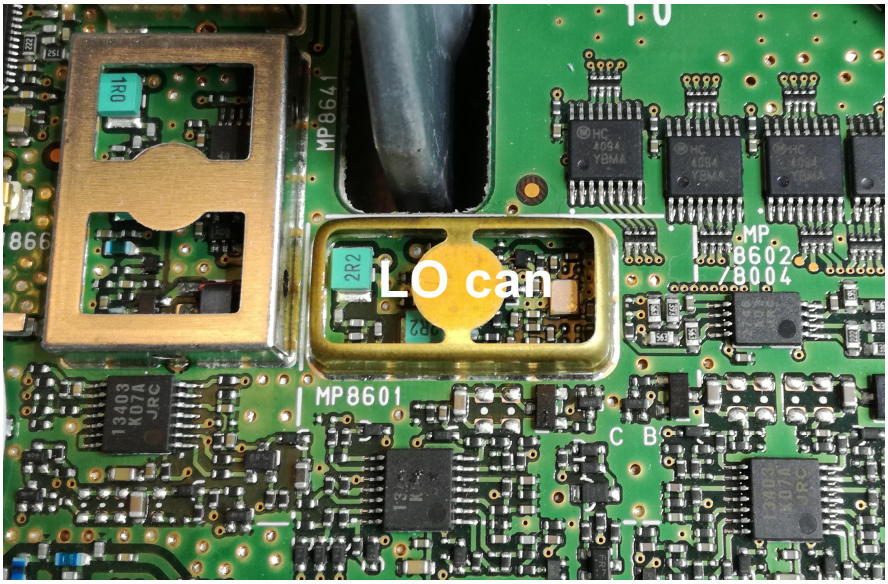
5. Turn the radio upside down
6. Unscrew the 12 JIS2 screws from the bottom cover
7. Gently remove the bottom cover

8. Turn the radio around so the front side faces you



9. Detach the SMA-U.FL cable from the U.FL connector “EXT REF IN” on the circuit board
10. Using the spanner unscrew the nut holding the SMA connector named “REF IN 10MHZ”
11. Remove the SMA-U.FL cable

12. Locate the dark gray foam cover
13. Gently remove the foam cover. It may be a bit sticky



14. Apply some solder to the big hole in the coupler board, so you don't have to apply solder when soldering it to the LO can
15. Position the coupler board symmetrically over the LO can with the U.FL connector visible to the left and the black inductor to the right facing down
16. While holding the coupler board, solder it to the LO can through the big hole in the center of the board. This should not take more than five seconds
17. Keep holding the board until the solder is set

18. Attach the new SMA-U.FL cable to the coupler board and the "REF 10MHZ IN"
19. Using the spanner tighten the nut on the SMA connector to the chassis

20. Gently refit the bottom cover on the radio
21. Screw the 12 screws into the bottom cover. Don't over-tighten them
22. Reconnect all the cables to your IC-9700
23. Connect the "REF IN 10MHZ" connector to the RFzero RF output using an SMA-SMA cable

You should keep the original SMA-U.FL cable and foam cover, in case you want to restore your IC-9700 one day.

Setup

Upload the IC-9700 program to the RFzero. The correct frequency and power level are already set. For more details please see https://rfzero.net/examples/ic-9700

To complete the setup please perform the steps below

1. Switch on the IC-9700 and let it warm up for at least 10 minutes
2. Meanwhile switch on the RFzero. It should lock to the GPS within a minute
3. On the IC-9700 select: <MENU> | <SET> | <Function> | <REF Adjust>
4. Set both sliders as close as possible to 50,0%
5. Make a stable carrier signal, or find one on the air. Then tune your radio to this signal, so you can hear it in SSB mode
6. Adjust the upper slider pressing the minus sign <->, until the signal begins to wobble. Then go back pressing the plus sign <+>, until the signal is stable again and make a note of the lower edge value, e.g. 45,9%
7. Again adjust the upper slider pressing the plus sign <+>, until the signal begins to wobble. Then go back pressing the minus <->, until the signal is stable again and make a note of the upper edge value, e.g. 48,6%
8. Calculate the mean value between the lower edge and the upper edge, e.g. (45,9% + 48,6%) / 2 = 47,25%
9. Adjust the upper slider to the calculated mean value, e.g. 47,1%. Please note that it may not be possible set the exact value by the decimal, but set it as close as possible