

## Adding a Discriminator Output to the ICOM IC-Q7

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The IC-Q7 is a miniature transceiver. It is mainly a very good receiver, with a very wide coverage from 30 MHz to 1300 MHz in NBFM, WFM and AM (Photo 1). The IC-Q7 is also able to receive the HF band with an appropriate programming. The IC-Q7 can transmit on the VHF (144 MHz) and UHF (430 MHz) bands, but its power is quite small, about 300 mW. The very compact and lightweight TX ICOM IC-Q7 (170 grams) is the perfect companion in a shirt pocket. In a very small package, it is good VHF - UHF receiver adapted to many uses.

To decode the numerical transmissions, it is necessary to use the direct output of the FM demodulator, called "discriminator" output. As there is no description of such modification for the IC-Q7, we have looked at the way to add it.



*Photo 1: Icom IC-Q7*

## Schematics study

Our first idea was to use one of the contacts of the jack connector 3.5 mm - 4 contacts for the discriminator output. After having completely disassembled an IC-Q7, we have seen that the interior is so miniaturized that the problem is not to make the perfect modification but rather to locate accessible points, which are not numerous.

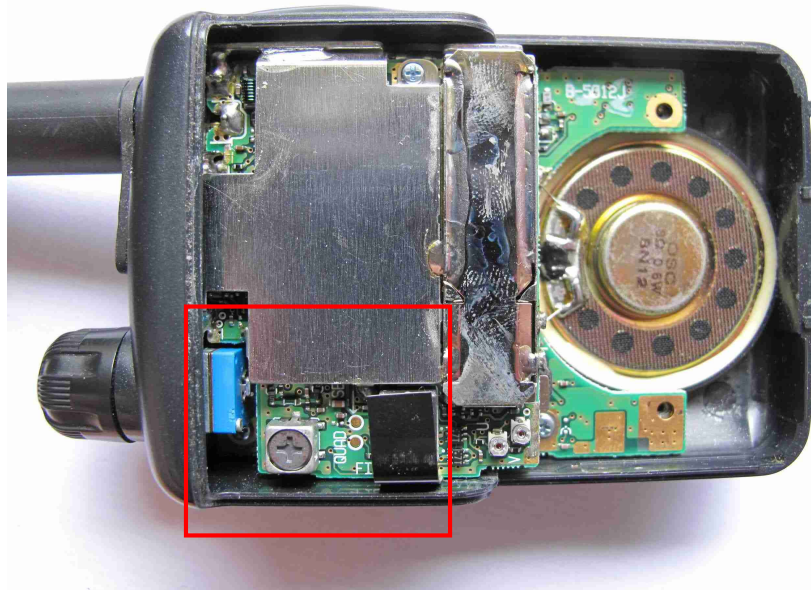
The addition of an extra connector in the battery case has been finally chosen. This allows making a modification easy to duplicate, without going too far in dismantling the IC-Q7.

The FM demodulator circuit is a Toshiba TA31136 FN. The demodulated output is situated on pin 9, at the angle of the integrated circuit. The PCB has 4 layers, which makes difficult to follow up the tracks. The only accessible point is the quadrature detector, noted "QUAD" on the PCB (Photo 2). This point will be used.

## How to make the output "discriminator" connexion

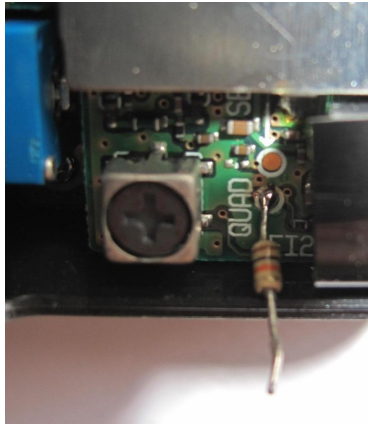
The construction is described step by step.

- 1 - Remove the 2 batteries R6 (AA), and 2 screws in the battery compartment.
- 2 - Remove the rear part of the housing by lifting the bottom part. It is not necessary to go further in dismantling (Photo 2).
- 3 - Locate the point marked "QUAD". This is the adjustment point of the FM demodulator.

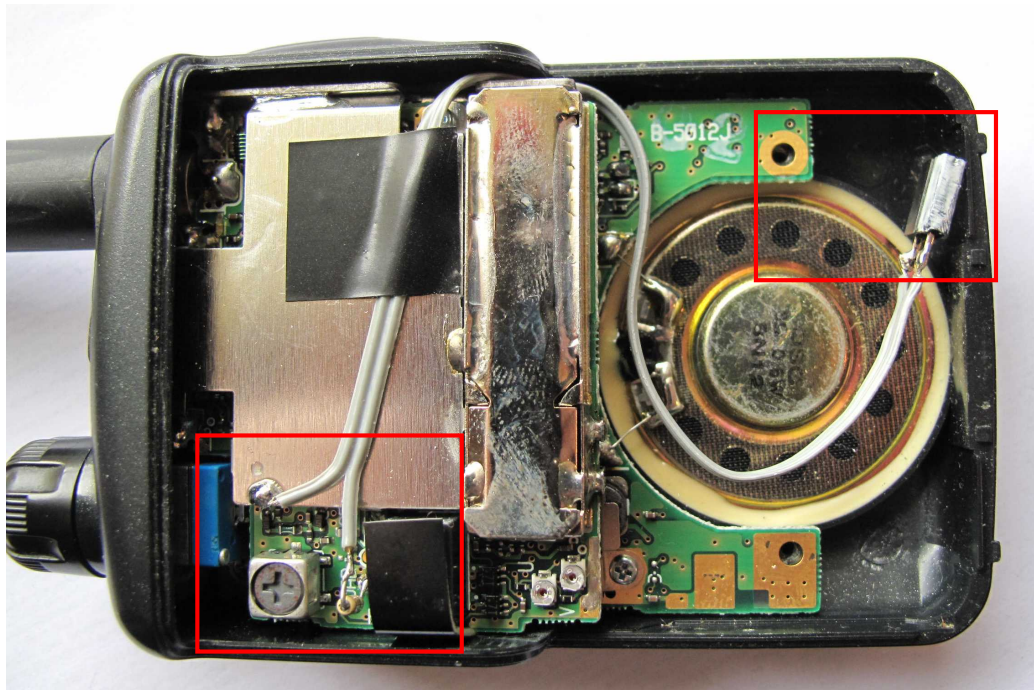


*Photo 2: The IC-Q7 with rear housing removed. Simply remove 2 screws.  
No need to remove more.*

- 4 - Solder a resistor 10 k $\Omega$  on this point (Figure 3). Use a miniature resistance.
- 5 - Prepare a double wire of about 10 cm. Solder one wire on the resistor 10 kilo-ohms and the other to ground on the shielding. A connector HE14 type (or equivalent) is soldered at the other end (Figure 4).



*Photo 3: The 10 kilo-ohms resistance welded on the "QUAD" point.*

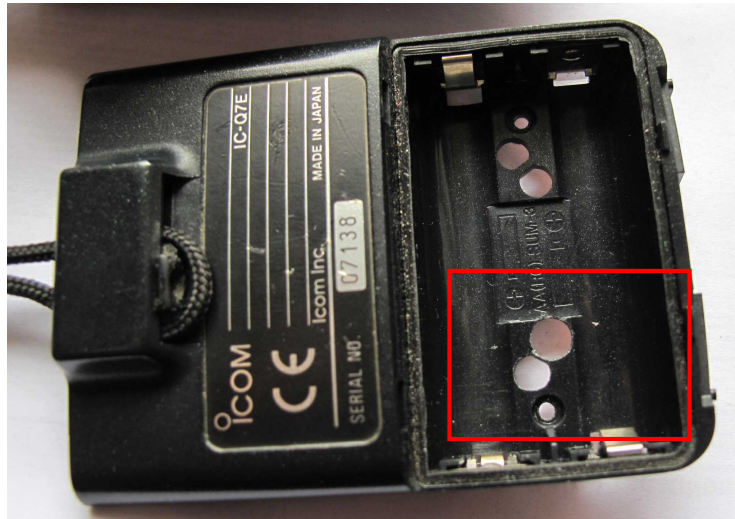


*Photo 4: The wires and the connector inside the IC-Q7. One end is welded to the 10 kilo-ohms resistor and to the ground on the shielding. The other end is welded to a HE14 connector. The active point was painted in white to recognize it from the ground in black.*

6 - Increase the diameter of one of the 4 holes in the battery compartment to 5.5 mm to allow passage of the connector (width 5.1 mm) between the speaker and the battery compartment (Photo 5).

7 - Replace the back cover of the IC- Q7

8 - Replace the batteries. The connector finds its place between the two batteries, and it does not interfere with replacing the battery cover (Photo 6).



*Photo 5: In the battery compartment, one of the 4 holes was enlarged to 5.5 mm diameter to allow the connector passage.*



*Photo 6: The wires emerge between the 2 batteries that are separated by an interval of 1 mm. The connector is folded between the batteries. The compact shaped connector does not interfere with the battery cover.*

### Using the discriminator output

Externally the IC-Q7 is unchanged and the modification cannot be seen. The only difference is hidden in the battery compartment. To use the discriminator output, a cable equipped at one end with 2 pins HE14 and the other end with a 3.5mm jack (Photo 7) must be added.

As example, by decoding the transmission of a distress beacon on 406 MHz, the output signals are very clean. The output level is about 100 to 200 mV (peak). It has a little lower amplitude than we usually encounter with classical receiver. Accordingly, we must slightly increase the decoder entry level and decoding works perfectly.

The decoding of 406 MHz distress beacons is explained in:

<http://www.f1lvt.com/files/333E-ConstructionDECTRA2274-P1-English.67.pdf>

<http://www.f1lvt.com/files/334E-ConstructionDECTRA2274-P2-English.69.pdf>

Minimum 5 kHz step of the IC-Q7 does not allow being on the exact frequency of 406 MHz distress beacon. But a beacon on 406.028 MHz is perfectly decoded on 406.025 MHz and 406.030 MHz for example.



*Photo 7: The connexion cable*