

Restoring Passband Tuning to the Icom IC-X75 Series Radios

by

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1.0 Introduction

This document describes a procedure I developed for restoring passband tuning to later models of the IC-275A and H radios. Passband tuning operates by shifting one IF filter passband in frequency relative to a second filter passband, thereby narrowing the effective IF bandwidth of the receiver in the presence of QRM. (IF shift is a related function, not present in the IC-X75, in which the whole IF passband is shifted in frequency relative to the QRM.) Passband tuning was offered in early production units of the IC-X75 series radios, but it has since been replaced by a packet-data audio level control in later units.

The IC-X75 series of radios by Icom is a popular line of VHF/UHF all-mode transceivers. The radios have been available since the late 1980s, and have been produced in at least two variants with slightly different features. They also were generally available in two power levels, with an 'A' suffix for low power and an 'H' suffix for high power. The following models were manufactured:

IC-575	6 and 10 meters
IC-275	2 meters
IC-375	1-1/4 meters
IC-475	70 cm
IC-1275	23 cm

The early production variant is identified by a square ICOM logo beside an oval containing a vertical black bar. These models have a pot in the upper right corner labeled 'PBT', for PassBand Tuning. To my knowledge, the IC-375 was only available in this version. Later production units of all models are identified by a smaller Icom logo with a lower-case 'i' dotted by a large circle. These units omit the PBT function, using the spot for a control labeled 'Data Level'.

Icom eliminated passband tuning by removing the second IF filter and jumpering its circuit traces with a capacitor to restore signal flow. They also redesigned the circuit board containing the Data and Notch pots on the front panel. The mixers and signal source required for PBT remain in place and are already operational. The modification procedure is to replace the missing filter and rewire the Data pot to drive the oscillator frequency control.

While I have not tried to modify any of them, I believe PBT may be restored to the other radios in the series in a similar fashion. The data level board should be the same in each case, with the major differences occurring on the main board. If you attempt to modify one of these sets, please get the appropriate service manual so that differences can be taken into account.

*** *Disclaimer* :*** I have performed the procedure on my own IC-275A and H units, and the new passband tuning function is a joy to use. I offer my experiences to assist you in upgrading your own unit. Please note that the

procedure is involved and requires careful technician skills and extensive disassembly of the radio. It will take a few hours to perform, but with care you will have the same success that I did. However, I must stress that you are on your own if you undertake the modification, and I take no responsibility for any damage resulting to your set.

2.0 Preparation

The modification begins with procuring the missing ceramic filter, which is a MuRata CFJ455K5. I obtained mine directly from Icom for about \$50, but the resourceful will likely be able to find it much more cheaply. I suggest checking with a variety of small components distributors, including the wholesale industrial outlets in your area, if you have access to them through work.

Obtain replacements for any burned out front panel lamps because you will be disassembling the front panel, a procedure you won't want to do a second time. To reconnect the DATA circuit, you will need a miniature 10K screwdriver pot with wire leads -- you want something smaller than a centimeter in diameter. You might also consider getting the service manual when you are on the phone with Icom. They won't be stocking them forever, and they're only \$30 from the factory. Icom Parts is 206-454-7619.

3.0 Modification Procedure

There are two approaches to the modification. The first method disassembles the front panel in order to gain access to the circuit board holding the pot. The shortcut version significantly simplifies the process by avoiding disassembly of the front panel. It is just as effective, but not quite 'factory-original' to my mind. The shortcut runs the three-wire cable from the data pot directly to the proper destinations on the main board. I have not used this method myself, but I know that it has been done successfully by others. If you elect the alternate approach, get the service manual and study it carefully to make sure the correct tie points for the cable wires are found. The paths for the two methods are parallel until the indicated split.

Procedure for both standard and shortcut methods:

- 1) Place the radio on the workbench, removing the microphone and all external cables.
- 2) Remove the top and bottom covers. Place the unit upside down, front toward you.
- 3) Disconnect all cable bundles and coax cables from the main board. Make a note of where every connector attaches to the board so you can put it all back. Remove 6 screws from the board, and then remove the board.
- 4) Identify the location for the missing crystal filter in the lower left corner of the board. Remove C61, an axial-leaded 0.001 uf capacitor, installed in the holes for the filter pins. Use solder wick to remove the solder from the rest of the holes that you will use to install the new filter.
- 5) Install the new MuRata filter you obtained. Re-install the board in the radio with the six screws, and plug in all the cable connectors according to the notes you made.

Standard Procedure Only:

- 6) Turn the radio over on the bench. Remove four screws to free the cast aluminum heatsink -- two are on top, and two are in the rear of the set. Carefully disconnect all cable and coax bundles to free the unit. Make notes once again as necessary. Set the heatsink aside for now.
- 7) Pop the cover on the logic cage on the right side of the radio. Disconnect the cable bundle going to the tuning knob. You will have to remove the adhesive tape protecting the wires from the edge of the shield cover. Be sure to use new tape when reinstalling the cover.
- 8) Remove the two screws on the side holding the front panel to the main chassis, and pop it out of its pivot joints. Be careful in handling the radio from this point so that cables are not stretched and broken. Place the radio on its

side, and remove 7 screws holding the shield to the rear of the front panel. Remove the cable bundles from the front panel (make notes), and remove the shield. If you use care, you can avoid removing the bundles on the right side of the front panel that go to the main chassis.

9) Remove 3 screws from the bottom of the front panel, and all the knobs. All knobs are push on, except for the tuning knob. By sliding off its rubber grip, an allen set screw is exposed. Remove the black plastic front panel. Remove 4 shaft nuts from the controls on the right side.

10) Remove 7 flathead screws from the front face. Do not remove the screw nearest the mic jack. Unsolder the small copper ground loop on the rear of the front panel beside the mic jack. Loosen the main front panel circuit board from its metal frame. Unsolder the small Data/Notch board from the front panel board at 4 points.

11) Set the radio aside for a moment, and focus on the small Data/Notch board. Unsolder the 3-wire cable going to the Data/Notch board. Cut the J18 connector from the cable end and save the connector for later.

12) Study the drawing included below (Figure 1). You will be making connections between the data pot and the 4 board edge contacts. Remove the two 4.7K resistors, R8 and R51, in the center of the board. They currently are being used to bias the PBT circuitry. Add the 3 jumpers shown in gray shading in the drawing to the back of the board.

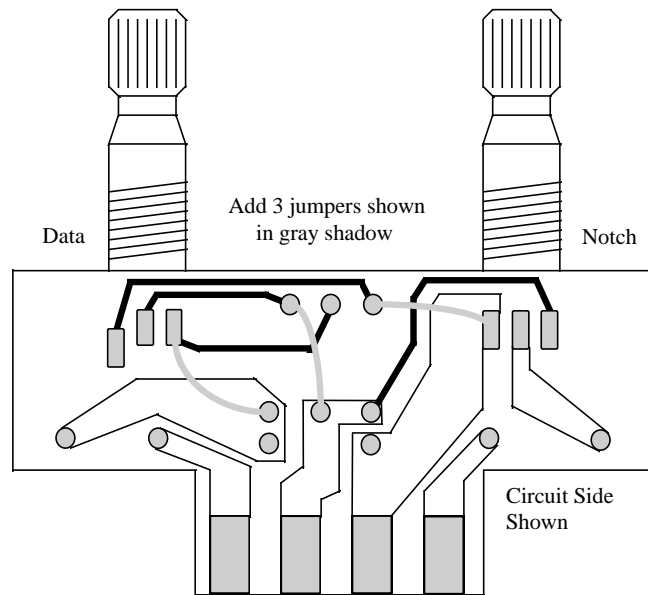


Figure 1. Jumpers to be added to the Data/Notch board

12) Take this opportunity to replace any burned out panel lamps.

13) Reattach the Data/Notch board to the metal front panel frame with its mounting washers and nuts. Reinstall the front panel circuit board to the metal frame with 7 screws. Pass the cable-tied wire bundle for the tuning knob through the proper hole. Install the mounting hardware for the other controls. Replace the copper ground loop behind the mic jack and resolder the four tie connections to the Data/Notch board.

14) Reattach the plugs to the back of the front panel circuit board by feeding them through their holes in the shield. This is a little awkward, so use care. Reattach the shield to the back of the board with 7 screws. Plug in the cable from the tuning knob into the logic section, dress the wires and replace the tape, and reinstall its cover shield. Install the 2 screws which hold the front panel to the radio chassis. Use a soft cloth to clean your fingerprints and dust off the front of the LCD panel, the meter, and the inside windows of the black plastic face. Reinstall the black plastic face, its screws, and install the knobs.

Procedure for shortcut method:

Note: I have not personally tried this version of the modification. Study the service manual to verify the connection points for the Data Level cable wires to the main board.

6) The 3-wire cable going to J18 attaches to the Data Level pot. Cut off the connector and save it for step 18.

7) Strip back the outer jacket of the cable for a couple of inches. The white wire is the CCW pin of the Data pot, the red wire is the wiper, and the shield is the CW pin. The red wire replaces the wire in pin 4 of J1 on the main board. The white wire attaches to +8V, which is available on pin 1 of J4. The shield connects to ground, which is available on pin 5 of J4. (If you can find exposed component leads connected to +8 and ground, such as the tops of resistors or diodes, tack the wires to them instead. Study the service manual carefully for these points.) Go to step 15.

Procedure for both standard and shortcut methods:

15) Find the power amplifier heatsink you set aside, and dress the cables underneath and through the pass-through holes to the underside of the radio. The red stripe coax goes to socket J4 on the RF YGR unit. The speaker lead plugs into the connector near the external speaker jack on the rear. Replace the 4 screws attaching the heatsink.

16) Now turn the radio on and verify that PBT works. CCW rotation of the DATA pot should cause a lower pitch of the IF noise, and CW rotation a higher pitch. Make sure all 4 panel lights are lit if you changed any.

17) You can stop modifying at this point if you don't care about using your radio for packet, and proceed to step 19. Otherwise, you need to install the small 10K pot across the J18 connector plug you saved. This task replaces the Data pot just disconnected above. Refer to Figure 2 below for the next step.

18) Using a narrow-blade jeweler's screwdriver, depress the retaining stops on the connector pins to remove them from the plastic shell. Once they are out you can solder them to the leads of the pot. But before you start soldering, plan how you are going to dress the leads to position the pot in the radio so you can adjust it later on; some spaghetti sleeving may be necessary on the wires. Reinstall the pins in the connector, and insert the connector in its socket, carefully making room for the pot in the surrounding wires and components.

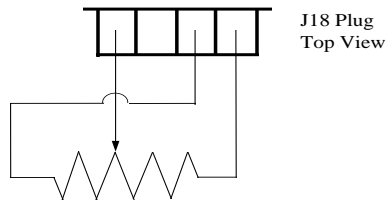


Figure 2. Adding a 10K pot to DATA connector J18

19) The final step is to check the alignment of the PBT circuit. Put your frequency counter on R140 on the main board; this is the 100-ohm, 1/4W resistor near the CFJ455K5 filter you added. In USB mode with the Data pot centered, adjust L28, the coil next to the adjacent 10.295 MHz crystal, for 10.295000 MHz. In my radio, it has a green slug. Next, in FM mode with the Data pot centered, adjust R310, the small blue pot next to the red and brown wires in J1 (rear of the main board) for 10.295000 Mhz. If you use packet, adjust the 10K pot on J18 for the proper level.

20) Replace the bottom and top covers of the radio, and install the screws. You're done.

4.0 Summary

This modification restores the Passband Tuning function to the IC-275 radio, and reconnects the DATA input for packet operation. The modification will not be visible from the outside of the radio, except that the Data Level pot now has a different function. Enjoy the new feature and good DXing!