

IMPROVE THE SQUELCH IN YOUR MONITOR RECEIVER

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The squelch control in some FM monitor receivers is difficult to use because of too much hysteresis. The American Heritage Dictionary of the English Language defines hysteresis as the:

- "Failure of a property changed by an external agent to return to its original value when the cause of the change is removed."

It's like having play in a car's steering wheel, or backlash in a gear set. Too much hysteresis in a squelch circuit forces one to keep the squelch at a tighter setting, missing weaker signals when scanning or searching. The squelch hysteresis problem was first addressed in a 1984 article about the Radio Shack PRO-24 crystal controlled scanner.

Why do engineers design these circuits with any hysteresis? Basically, hysteresis prevents weak signals from "popping" the squelch open and closed rapidly, which would be very annoying to the listener. A squelch circuit with hysteresis requires a stronger signal to open the squelch than it does to keep it open.

Models cursed with too much hysteresis include the Bearcat 800XLT, Radio Shack PRO-2003, PRO-2004, and others. Don't despair, the fix is simple for most radios. Unfortunately, the Uniden/Bearcat 600XLT and 760XLT series use tiny surface mount components, which makes modification very difficult. I've successfully reduced the squelch hysteresis on other models by replacing a single resistor.

Hysteresis is usually implemented by providing feedback from the squelch gate input to output, through a resistor. The higher the resistor value, the less feedback there is, and less hysteresis. My modification involves replacing the "stock" resistor with a higher value resistor, as identified in the table below.

This article cannot provide step-by-step instructions for each radio. I always encourage radio hobbyists to purchase the service manuals for their equipment. The most useful sections of the manual are the schematics and printed circuit diagrams. Good manuals will also describe the theory of operation and alignment procedures, and contain a complete parts list.

If your radio has too much hysteresis, and is not listed in the table, study the service manual. Motorola MC3357, MC3359, and MC3361 integrated circuits, which contain IF and squelch circuitry, are popular in scanners. In these receivers, look for the hysteresis resistor to be connected to these ICs.

Notes

1. The author cannot furnish modification information for other radios.
2. Don't attempt this, or any other internal modification, unless you are skilled in electronic servicing.
3. Make sure your receiver is disconnected from any power source before opening the cabinet.

Table 1. Squelch Hysteresis Resistor In Selected Receivers

Squelch Hysteresis Resistor In Selected Receivers			
Receiver Model	Resistor Designation	Factory Value	Comments
Radio Shack PRO-24	R35	33K	replace with 220K. Located between pins 12 and 14 of MC3357 (IC1)
Radio Shack PRO-2002	R197	47K	try 220K.
Radio Shack PRO-2004	R148	47K	remove R148 or replace with 220K. On linear board, between pins 12 & 14 of TK10420 (IC2)
Radio Shack PRO-2022		33K	replace 33K with 220K. Between pins 12 & 14 on IC-1 MC3361
Bearcat 220	R75	2.7M	may be ok as is
Bearcat 20/20	R75	2.7M	may be ok as is
Bearcat 250	R66	2.2M	may be ok as is
Uniden/Bearcat 760XLT	R58	22K	replace with 1M. Located on pin 14 of MC3359P IC
Uniden/Bearcat 800XLT	R91	860K	replace with 2.2M. Located on pin 14 of MC3359P IC
Plectron P1	R81	180K	may be ok as is
Plectron 700	R96	180K	replace with 560K

References

1. "The Radio Shack PRO-24 Scanner," by Bob Parnass, excerpted in the "Technical Topics" column, RCMA Newsletter, February 1984.
2. "The Bearcat 800XLT ... an Owner's Report," by Bob Parnass, in Monitoring Times, March 1986.
3. "Product Review: The Radio Shack PRO-2004 Programmable Scanner," by Bob Parnass AJ9S, in The Radio Enthusiast, February 1987, and Monitoring Times, March 1987.

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