

# Repair Tips for Bearcat Scanner Radios

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## Introduction

The original Bearcat scanner line was manufactured by Electra Company, a division of Masco Corp of Indiana. In the mid 1980s, Uniden, a Japanese company, bought out the Bearcat scanner line and Uniden's first Bearcat scanner was the BC800XLT model.

Most of the models discussed in this article are base/mobile units made by Electra during the 1970s and 1980s although some of the capacitor failures occur in the Uniden BC800XLT, too.

Electra stamped all of its scanners with a manufacturing date code on the rear of the cabinet. The code is comprised of a single character (C = Cumberland, Indiana, P = Puerto Rico), followed by four digits denoting year and week the radio was built. For example, "P8422" denotes the radio was made in the Puerto Rico factory during the 22nd week of 1984.

One way to roughly estimate a radio's age is to examine the 4 digit date codes often stamped on the integrated circuits. The radio must have been made after the most recent date stamp.

## Schematics, Owner's Manuals, and Parts Available

The re-incorporated Electra Corporation sells crystals, antennas, power cords, owner's manuals (\$11 ea) for some older (pre-Uniden) Bearcat scanners. Electra Corporation is located at 11915 E. Washington St., Cumberland, IN 46229. Phone 317-894-3229.

I cannot furnish schematics, manuals or parts. To order a user manual for an Electra/Bearcat scanner from Uniden, call (800)235-3874 extension 2553.

Some schematic diagrams may be obtained from Uniden/Bearcat's parts department, (800)297-1023. Uniden

currently charges a flat rate of \$54 for scanner repairs. They will repair and return "out of warranty" items without an estimate unless the repair charges exceed the flat rate charges.

The phone number for repair is (800)297-1023, too. I recommend you call repair before sending the broken scanner. Items for repair via UPS (include receipt if still under warranty) are usually sent to:

Uniden America Corp.  
4700 Amon Carter Blvd.  
P.O. Box 95002  
Fort Worth, TX 76155

If Uniden doesn't have a schematic, try obtaining a Photofacts from Howard Sams Publishing division of Prentice-Hall at (800)428-7267, [http://www.hwsams.com/sams\\_model\\_new.html](http://www.hwsams.com/sams_model_new.html)

G & G Communications (telephone (716)768-8151) is a family owned company which repairs scanners and stocks parts for several older models, especially Electra/Bearcat and Regency brands, but they don't sell manuals or schematics. They are located at 9247 Glenwood Drive, LeRoy, NY 14482. (<http://www.iinc.com/ggcomm/> or email [ggcomm@iinc.com](mailto:ggcomm@iinc.com) or [ggcomm@aol.com](mailto:ggcomm@aol.com))

## Common Construction

Most of the classic, metal-cased Bearcat base/mobile models were built using two printed circuit boards:

1. a "radio board" containing the synthesizer, RF, IF, and audio stages, and
2. a "feature board" containing the microprocessor controller and memory circuitry which gave each model its own personality.

Although there are various vintage radios boards, they all have similar circuitry. Before addressing specific symptoms, circuit boards in the malfunctioning scanner should be inspected for poor solder joints.

The Electra/Bearcat BC350, BC300, BC250, BC220, BC20/20, BC211, BC210, and BC210XL models were hand assembled, and every one I've serviced had several connections that were either soldered poorly, or not soldered at all.

Resoldering joints on the ribbon cable connecting the RF and keyboard logic circuit boards in a BC250 attenuated the microprocessor/synthesizer hash noise noticeably.

A Bearcat 20/20 was experiencing periodic loss of memory on some, but not all channels. When the problem occurred, the frequencies on some channels would be completely changed. On other channels, the frequency would still be intact, but the channel would be locked out, and the delay toggled from "on" to "off". Some channels were not affected.

The 2 "AA" memory backup batteries, and their holder, tested good. Much time was spent tracing logic, heating and cooling components, and making voltage measurements.

One of the secondary leads from the power transformer was connected to the main circuit board through a hole drilled through foil traces on both the top and bottom sides of the board. A close examination revealed that this lead had been soldered only on the top of the board - the bottom side had never been soldered.

Soldering the lead on both sides of the board solved the memory loss problem.

Matt Roberds fixed a BC220 which experienced memory loss if power was removed by resoldering the positive wire to 2-AA battery holder.

As built, the BC220 logic board is grounded only through its mounting screws. In the BC220, Matt recommends adding real wire ground jumpers from the main board to the feature (logic) board to fix grounding problems.

## Symptom: Blank Display

The BC300 scanner, and several other Bearcat models, employ a switching type power supply stage to generate plus and minus voltages in excess of 20 volts DC. When this switcher fails to function, the display goes blank, but the squelch control appears to work, and white noise can be heard in the speaker.

In almost a dozen of the BC300 and BC800XLT scanners I've fixed, C98, a capacitor in series with the primary of the switching transformer failed, causing the output of the supply to drop below the level needed to power the display. The switching transformer is mounted on the RF circuit board, and is much, much smaller than the main power transformer, which is usually fastened to the metal chassis. See March 1996 Monitoring Times magazine for BC800XLT capacitor locations and repair information.

The 22uF/16V capacitor used for C98 in early BC300s was marginal, and was replaced with a 47uF/25V capacitor in later units.

Jim Craig replaced a 22uF/35V C98 capacitor to repair his BC210XW.

Paul Grohe replaced a failed C98 with a low ESR (equivalent series resistance), high frequency, switching regulator grade capacitor, e.g. a Panasonic HF series capacitor. He also recommends adding a 0.1 ceramic capacitor in parallel with C98.

I replaced the 22 uF capacitor in the switching power supply stage of a BC210XL which caused the same symptom. Other capacitors in the switcher stage have failed. C114, a 4.7 uF/35V tantalum capacitor failed in at least one BC250, causing the display to blank.

A more sinister problem affects the switcher in earlier models. The switching supply stage in the BC250 and original BC210 is driven by a clock signal derived from a custom Exar NC57902 divider integrated circuit (designated IC6 in the BC250 scanner). I've seen this divider IC fail in several BC250s, causing a blank display (except for a decimal point in the BC250's rightmost digit). This custom IC is no longer available from Uniden.

Failure of IC9, the 9 volt NJM78M09A regulator in a BC800XLT is another cause of a blank display.

## Symptom: Invalid Frequency Displayed

A common Bearcat 250 malady is manifested by an invalid frequency displayed on the readout. This condition is temporarily "cured" by unplugging the AC line cord from the wall, then replugging it. This condition is symptomatic of a power supply problem in which Q204, a Texas Instruments TIP-29 located on the feature circuit board, fails.

A Philips ECG291 will work as a substitute for the TIP-29. Don't try a Radio Shack substitute, it hasn't worked. See Martin Toomajian's article, "Bearcat 250 Erratic Display Cure", in January 1987 Monitoring Times.

A similar problem in the Bearcat 20/20 was discussed previously in the section on bad solder joints.

Matt Roberds repaired the Montgomery Wards version of a BC220 and contributed these insights:

"I did add some heat-sinks, but you have to be careful what you do with the TIP29 on the logic board. I added a long, flat heatsink to it and immediately created a whine in the audio. I didn't use an insulator, as this was a temporary first-try. As far as I can tell, the heatsink was radiating noise from the logic board into the front end on the radio board, which ended up being just below the heatsink. Bypassing the TIP29 (a voltage regulator) with disc ceramics didn't work; using a smaller heatsink and an insulator fixed the problem."

"There is also a 220 ohm 1/4 watt resistor on the logic board. It feeds the TIP29 from the main +16v supply. It looked a little crispy. I pulled one end and measured the current through it and it was about 30-35 mA. This works out to right at 0.2-0.25 watt dissipation. I didn't have a higher-wattage resistor, so I substituted 2 470-ohm resistors in parallel."

## **Symptom: Squelch Won't Eliminate White Noise**

Most Uniden/Bearcat base/mobile scanners feature an AUTO squelch position, actuated by rotating the squelch knob fully counter clockwise. The BC350 used a separate pushbutton switch for this purpose. These scanners use a flimsy potentiometer (designated R81 in BC300s) internally mounted on the RF circuit board, to set the level of signal required to open the squelch when in the AUTO position. This pot also has an effect on the squelch action in the non-AUTO mode, and determines at which point the squelch knob must be positioned in order to silence the radio.

Although the potentiometer is adjusted at the factory, changes in component values due to aging often necessitate readjustment of this internal pot. Misadjustment of this pot has been the cause of "no squelch" complaints in two BC300s and a BC250 I fixed.

Another squelch failure is due to a blown transistor that acts as the electronic switch in the squelch circuit. I replaced this transistor in only one BC300, so I don't know if this is a common problem.

## **Symptom: Scanner Completely Dead**

In Bearcat scanners using an internal power supply (e.g., BC350, BC250, etc.), the main power transformer is connected directly to the AC line. Since the on/off switch is on the secondary side of the transformer, current flows in the primary as long as the AC line cord is plugged into an active AC outlet. These transformers contain an internal circuit breaker, not visible without unwinding (destroying) the transformer. The internal breaker is known to fail prematurely in a batch of Bearcat power transformers.

If your scanner is completely dead, check the primary of this transformer for an open circuit condition.

## **Symptom: Keyboard Bounce**

After much use, the Chromerics keyboards in Bearcat scanners start to wear out. The first sign of trouble is usually keyboard bounce on the most frequently used key, e.g., the MANUAL key. Replacement keyboards are usually available from UNIDEN, but replacement requires dexterity, as one must take care not to tear the flat, flexible strip connecting the keyboard to the logic board.

## **Symptom: Keyboard Completely Unresponsive**

The keyboard matrix is "scanned" by the microprocessor. Another problem is when none of the keys seems to function; the receiver just keeps scanning in spite of key depressions. I found this condition in a BC210XL scanner owned by a heavy smoker. Perhaps nicotine smoke was to blame, as the resistance between two input port pins on the microprocessor was down to about 1000 ohms, fooling the microprocessor into believing that a key was stuck in the "down" position. Scraping the circuit board between the two pins with an X-Acto knife fixed the problem.

## **Uniden/Bearcat BC200XLT Portable - Loss of Audio and Dial Lamp**

If you can program frequencies into your BC200XLT but there is no audio and the green backlight no longer functions, a tiny transistor may have failed.

Check for a defective PNP surface mount transistor, Q201 (2SB815B6-YDY). Q201 is used as a switch to furnish 8 VDC to several stages of the BC200XLT. Its main purpose is to switch off power hungry stages of the BC200XLT when the CPU thinks the NiCd voltage has fallen below a threshold. That's an attempt to limit the current drain on weak NiCds to avoid permanent damage.

Q201 is located on the foil side of the "Micom" board, adjacent to the black multi-pin connector which mates the Micom and main boards together.

Q201 can be destroyed by a few different causes, primarily, by something in the scanner drawing too much current through it. In one case, capacitor C36 shorted. It's a 220 uF 10v electrolytic, located on the component side of the main board, connected from pin 8 of the audio IC (IC2 NJM386SL) to ground. Capacitor C55 shorted in another BC200XLT. Gary Bean reports he substituted a 2SA1298 for Q201 and it worked fine. In a pinch you bypass Q201 by soldering a short piece of bare wire between the collector and emitter, but you must first fix the component which caused Q201 to fail.

## **BC9000XLT: Loss of Sensitivity**

John Ward has fixed two BC9000XLTs which suffered from "low sensitivity." He fixed the solder joint where the antenna jack connects to the circuit board. In both cases the tab from the board was on the opposite side of the jack from where the little blob of solder applied at the factory was located.

It was an intermittent problem that depended upon the position of the antenna cable - if the weight of the cable placed tension on the jack in one direction contact was made and the radio worked fine. If the cable placed tension on the jack in the opposite direction contact was lost and so was reception. The gap was barely noticeable.

## **Other Problems**

Complaints of low audio output and occasional microphonics in three Uniden/Bearcat 800XLTs were caused by a bad 47 ufd electrolytic capacitor in series between the external speaker jack and audio amplifier.

Andy Domonkos reports he often uses a tape recorder connected to a Uniden/Bearcat BC890XLT. RL-1, the carrier activated relay inside the BC890XLT wore out. Andy found the identical relay sold at Radio Shack (part #275-232) and says the BC9000XLT uses the same relay, too.

## **Replacement Bulbs for BC760XLT**

The Uniden BC760XLT's SCAN, MAN, PRI, and HOLD buttons are illuminated by "grain of wheat" type incandescent bulbs. Gary Saffer reports that the bulbs and buttons are located on a small printed circuit board which sits behind the radio's face plate. Gary unsoldered the burned out bulbs in his radio and replaced them with 12 volt Radio Shack bulbs (#272-1092c). They should last a long time when powered by the 8 VDC supplied by the BC760XLT.

## Open Resistor in BC140

Robert Casey fixed his deaf, 16 channel Bearcat BC140 scanner. A 10 ohm resistor had opened that fed a circuit that generates 22V for the varactor diode tuner circuits. Without the 22V, there was no tuning of the local oscillator and front end, and no reception. What he did was compare voltages to a second working BC140.

## Sources for Replacement NiCd Battery Packs

Replacement NiCd battery packs and inserts for the BC100XLT, BC200XLT, BC2500XLT, BC3000XLT, and other scanners are available from Uniden. I've purchased them at lower cost from:

1. Mr. NiCd - E. H. Yost and Company, 2211-D Parview Rd., Middleton, WI 53562. tel. (608)831-3443. email [ehyost@midplains.net](mailto:ehyost@midplains.net)
2. Battery-Tech Central, 2818 Southland Street SW, Cedar Rapids, IA 52404-4141. tel. (800)267-3087 or (319)364-0855. email [rlassoc@inav.net](mailto:rlassoc@inav.net)
3. Batteries Plus has stores across they country and some have rebuilt Uniden NiCd packs for under \$20.

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