

Cellular Coverage For Your New Realistic PRO-2004

And some other goodies, too!

BY BILL CHEEK, "DR. RIGORMORTIS"

So, you bought the new Realistic PRO-2004 VHF-UHF scanner with all that awesome frequency coverage, only to find that it won't cover the cellular bands as it was originally supposed to do? Or, perhaps you have decided NOT to buy the PRO-2004 because it doesn't feature the cellular frequencies, contrary to what their 1987 catalog depicts? Yes, Radio Shack's corporate fathers deleted the cellular coverage in the PRO-2004 at the last moment before the scanner appeared in the stores. The decision was reached as Congress and the cellular telephone industry were conjuring up the Electronic Communications Privacy Act (ECPA). Radio Shack thus established their philosophy that cellular transmissions should be entitled to privacy and protection.

Fortunately for the monitoring hobby, they had to RETROFIT to delete cellular coverage from the PRO-2004, because the radios had already started rolling off the production lines before the Big Decision. This makes it exceptionally easy to UN-retrofit and restore the full performance capability of the two cellular bands, 825.0 MHz-844.995 MHz and 870.0 MHz-889.995 MHz. The cost of this modification is zero, if you do it yourself.

The procedure is simple, and just about anyone with a Philips screwdriver and a pair of diagonal cutting pliers can do the job. If you don't trust your technical prowess, a pro-shop should be able to do the job for you for around \$25. Use photos 1 and 2 to guide you through following the steps:

Steps of Procedure For Recovering The Cellular Bands

1. Remove the four screws from the rear of the radio. Slide the chassis forward and out of the case so you can easily maneuver it around for examination and work.

2. Turn the radio *upside down*. Locate a metal "box-like" sub-chassis in the center area of the main chassis. If there is any doubt, the correct subchassis is the one that has the RESTART switch, SW-501. (See your Owner's Manual for location of the RESTART switch on the back panel, and don't confuse it with the RESET key on the front panel.) The subchassis is marked, "PC-3" in the rear area of the board. Carefully pry off the metal cover of this sub-chassis. Inside, you will see a 64-pin Integrated Circuit

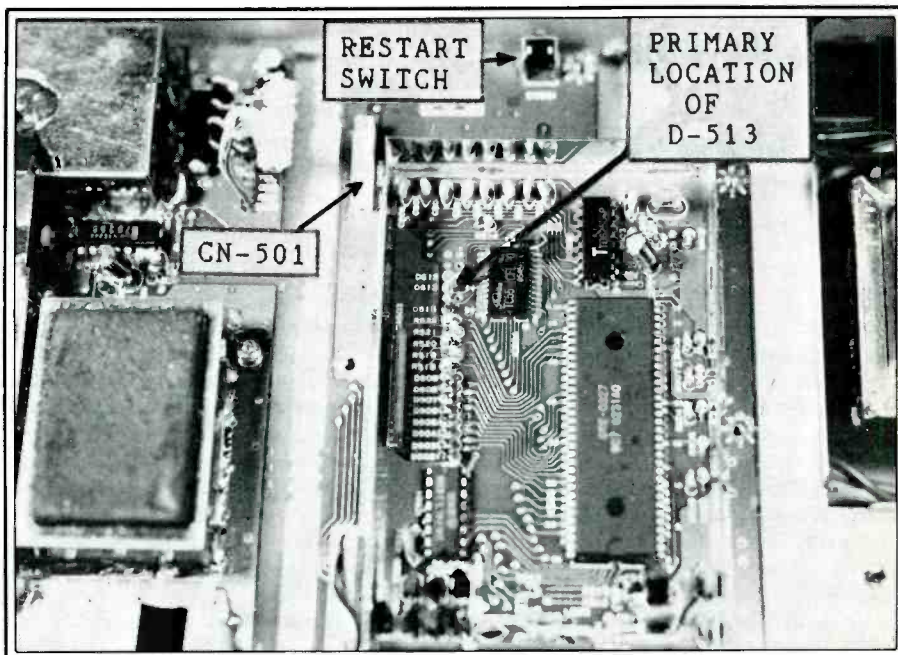


Photo 1: Cellular modification.

"chip," the only chip of this size in the radio. By the way, this chip is the CPU.

3. Refer to photo 1 and examine the component side of this board in the area where there is a row of diodes and resistors. At one end of the row will be D-502. Look at the OPPOSITE end of this row and locate diode, D-513. It is possible that D-513 won't be present; if not, there will be a spot marked for it anyway.

A. If D-513 is present, clip the accessible end of it, and push the two cut ends apart so they can't touch. That's it; you now have the cellular coverage for which the PRO-2004 was originally designed.

BUT WHAT IF YOU CAN'T FIND D-513? Right! In some models, it is NOT where it is supposed to be. No problem. You just have a little more work to do first. **PERFORM STEPS B, C and D ONLY IF D-513 IS NOT INSTALLED.**

B. CAREFULLY loosen and remove the 9-pin cable-harness connector, CN-501, from the subchassis (see photo 1). It's located toward the rear, left side of PC-3. Don't remove the other cable-harness connectors.

C. Remove the seven (7) screws which secure the PC-3 subchassis to the main chassis. Turn the subchassis upside down so

you can see the solder-side of the circuit board.

D. Refer to photo 2: Somewhere on the solder side of this board, there will be a single, solitary diode . . . probably in the vicinity of where D-513 is marked on the other side of the board. Don't worry, though, because there won't be any other components on the bottom of this board to confuse you. CLIP one lead of this diode and spread the two cut ends apart so they can't touch. That's it; you now have the cellular coverage for which the PRO-2004 was designed!

A note on operation in the cellular bands: The allocated channel spacing in the two cellular bands is different from all other bands covered by the PRO-2004: 30 kHz! This is of special importance when SEARCHING in the cellular bands, because if you press the STEP key on the front panel, you'll change the STEP INCREMENT from 30 kHz to 5 kHz. Press the STEP key again, and the increment changes to 12.5 kHz. Press STEP one more time, and the increment becomes 50 kHz. Press it again, and it goes back to 5 kHz! WHAT, no 30 kHz as required? Right! The 30 kHz STEP INCREMENT is not a normal function of the CPU, and it is available in the SEARCH MODE

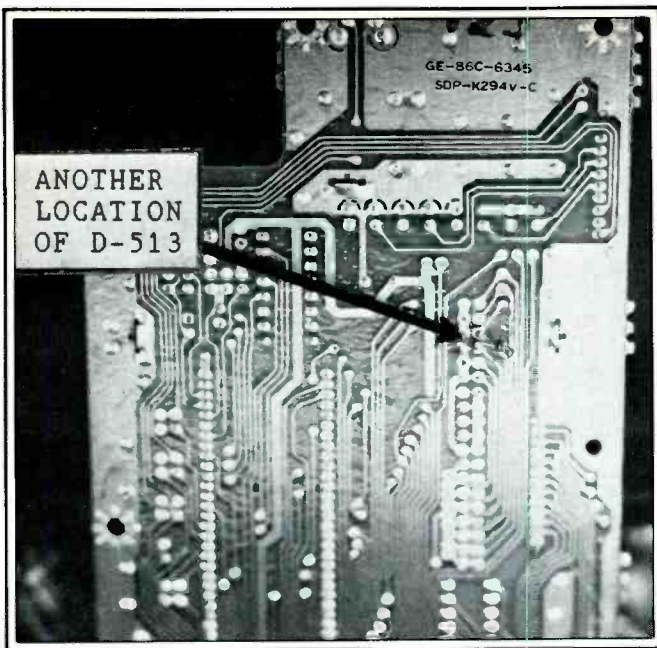


Photo 2: Cellular modification.

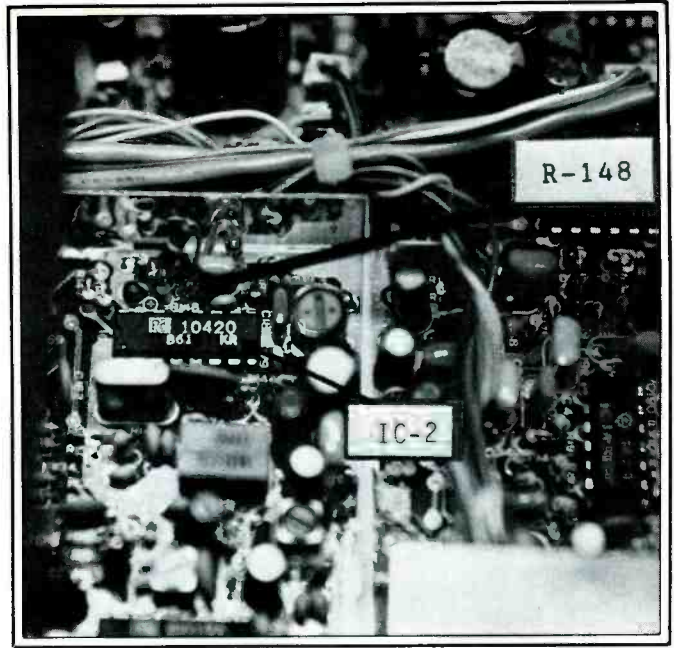


Photo 3: Squelch modification.

only in the designated cellular bands. To get back to the 30 kHz STEP INCREMENT after you have pressed the STEP key, you'll have to press the RESET key on the front pane. The CPU will then automatically select the 30 kHz STEP function when SEARCHing the cellular bands. Don't confuse the RESET key on the front panel with the RESTART button on the rear panel.

PRO-2004 Squelch Improvement

One of the few design deficiencies in the PRO-2004 is a sloppy SQUELCH action. It resembles "backlash" in a loose gear train. To see what I mean, start from the MINIMUM Squelch position and slo-o-wly increase the Squelch until the noise is silenced. Now, back off the Squelch Control until the silence breaks. See what I mean? Fortunately, there is a simple cure. Cost of this improvement is less than \$1.00. Refer to photo 3 and follow these instructions:

1. Refer to photo 3: Place the radio, with the case removed, in the normal, upright position, so you can see down into the top area of the main chassis. Locate the subchassis with a metal cover that is partly hidden under the sloping face plate of the radio. This subchassis is, more or less, laid out in the right half of the radio, and is square in shape. There are thirteen holes in the cover for alignment purposes. Carefully pry the cover off this subchassis. The circuit board here is marked "PC-1," but you can't see it because it is hidden under the sloping front panel.

2. Locate IC-2, which will be in the far left side of the "PC-1" subchassis, and off by itself, away from the other integrated circuits (photo 3). The type number of this IC is TK-10420, though the "TK" may not be

marked on the chip. IC-2 is located just to the left of a crystal, X-2.

3. Locate R-148, a 47-K resistor (yellow-violet-orange) between Pins 12 and 13, on the left side of IC-2. It is clearly marked on the circuit board.

4. Cut the top lead of R-148 somewhat up and away from the body of the resistor, and spread the two cut ends apart. Leave enough resistor lead to solder to later. NOTE: The UPPER lead of R-148 is painted, so it would be a good idea to FIRST melt the paint and tin that section of the lead with solder before cutting it.

5. Solder a resistor of about 68-K ohms to 150-K ohms, 100-K nominal, (value not too critical) between the two cut ends of R-148. (I used a 100-K resistor in mine.) That's it. Test your Squelch action now! It's notably improved! You can elaborate on this simplistic version by substituting a variable resistor of about 250-K ohms in lieu of the fixed resistor. Adjust the trimmer resistor for desired, tighter Squelch action without "pumping" on critical level signals. Too high of a resistance causes "pumping," while too low resistance doesn't cure the "backlash."

How About An S-Meter For Your PRO-2004?

Would you like to be able to discern difference of signal strength among different stations? Do you use a scanner beam antenna, and if so, wouldn't it be nice to know EXACTLY where to point it for maximum (or minimum) reception? Do you experiment with different antennas, but because of the lack of an S-meter, you're not sure which antenna works best for you? Relax! The cost of this modification should be less than \$5.00. The job is easy, and all you need are basic hand tools, a drill with 1/4" bit, and

some kind of a voltmeter, digital or analog, that is capable of reading between 1 and 3 volts, DC. Photos 4 and 5 will guide you in the following instructions:

1. Place the radio, with the case removed, in the normal, upright position, so you can see down into the top area of the main chassis. Locate transistor Q-9 which is in the far-right front area of the radio just beneath the sloping front panel. (See photo 4.) Q-9 is positioned just outside and to the right of the metal subchassis described above in the Squelch Improvement. Q-9 is visible and easy to get to. Push or gently bend Q-9 toward the front panel to expose its three leads.

2. Drill a 1/4" hole in the rear chassis of the radio, wherever convenient. One good location is in the vicinity of the speaker just below its right-hand edge, on the rear panel. Temporarily remove the speaker assembly if you like this location for the RCA Jack. See photo 5.

3. Install an RCA Jack in the 1/4" hole. (Radio Shack Cat #274-346.)

4. Install one lead of a .01-μF ceramic disc capacitor (Radio Shack Cat #272-131) to the center lug of the RCA jack, and the other lead to the ground lug of the RCA Jack.

5. Clip off all but 1/4" of the leads of a 10-K ohm resistor. Carefully, solder one end of the 10-K ohm resistor to the collector, (center lead), of Q-9. NOTE: Pre-tin the center lead of Q-9 and the resistor leads before soldering the resistor to it. Use a low-heat solder gun with a slender tip for this connection, and you won't have to remove Q-9 from the circuit board.

6. Solder a 12" wire to the free end of the 10-K resistor. Slip a 1" section of small heat shrink tube or other insulated tubing over the wire and resistor to protect it from shorting against anything.

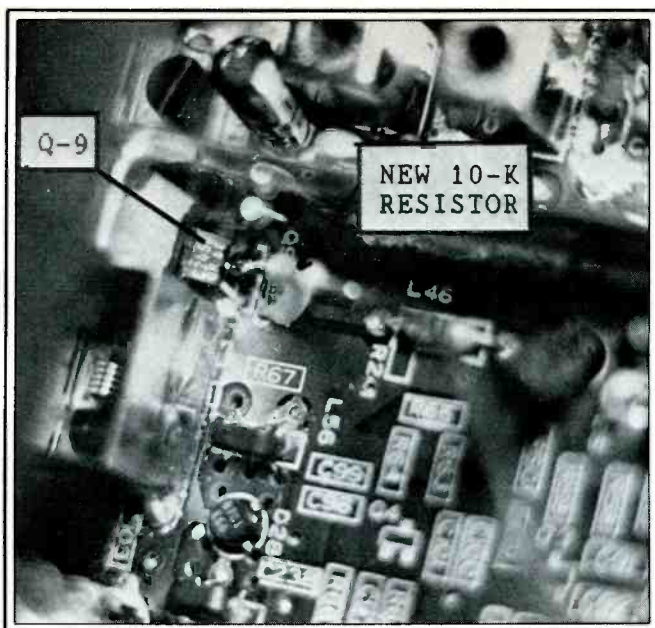


Photo 4: AGC S-meter modification.

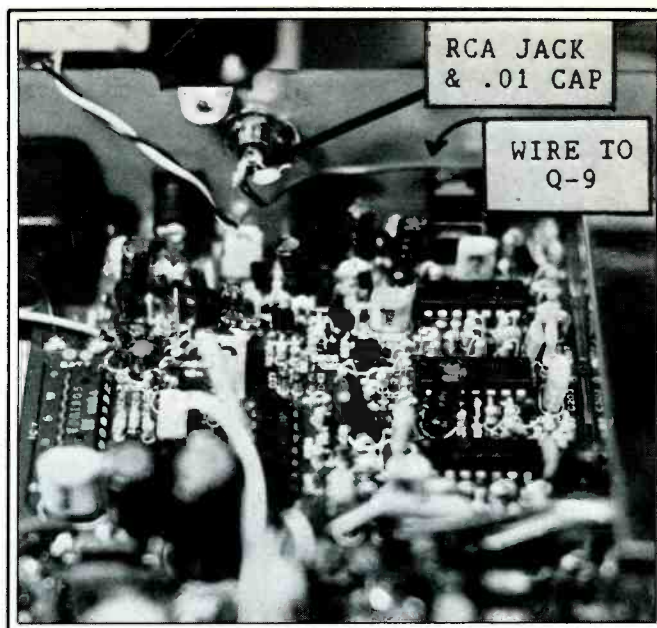


Photo 5: AGC S-meter modification.

7. Route the wire around the several sub-chassis to the rear of the radio and solder the free end to the center lug of the RCA Jack.

That's it. Now connect a voltmeter to the new RCA Jack. Use an RCA Plug, Radio Shack Cat #274-339, and a pair of leads from the plug to your voltmeter. (Shielded wires not necessary.) The Black (–) lead of the voltmeter should connect to the shell

(ground) of the RCA Plug. The Red (+) lead of the voltmeter connects to the center (hot) lug of the RCA Plug. The voltmeter can be either digital or analog, but a digital voltmeter offers MUCH better resolution with two or more decimal places. Now tune the PRO-2004 to a channel that has no activity. The voltmeter reading will be around + 1.87 volts DC when no signals are pres-

ent. Then tune the scanner to a busy channel and note the increased voltage! Extremely strong stations will "max out" at around + 2.6 volts. The voltage variation at this jack is proportional to the strength of the received signal. This gives you the capability to objectively evaluate received signals and/or the performance of your antenna system.

For example, to compare two or more antennas, select a base station signal such as a NOAA Weather Station (162.xxx MHz). Jot down the Received Signal Level (RSL) indicated by the voltmeter. Then change antennas and take another reading from the voltmeter. The higher reading indicates the better antenna for that frequency. Just be aware that any given antenna can work better on some bands than others. You'll want to perform the above tests on as many bands as possible, and then repeat the tests in an identical manner for any other antennas you want to evaluate.

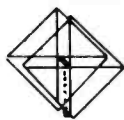
The theory of this S-Meter feature is fundamental. All we're doing is measuring the receiver's IF AGC (Intermediate Frequency Automatic Gain Control) voltage at the RCA Jack. The 10-K resistor isolates Q-9 and its function inside the radio from anything external, including short circuits, that you (or your kids) can stick into the RCA Jack. The .01-μF capacitor protects and filters the AGC line from introduction of external RF fields and interference through this port. While the range of the AGC voltage at the RCA Jack is rather slim, the variance is directly proportional to the strength of the received signal. That's why a digital voltmeter with two decimal places will give you all the resolution you'll ever need to fully utilize this enhancement. Radio Shack offers several digital voltmeters, two of which are eminently suitable (and economical) for this purpose: 22-188 goes for \$34.95 or 22-170 at \$29.95.

HAPPY MONITORING!

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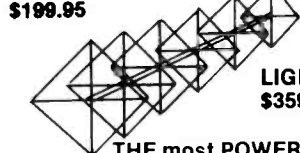


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