

Welcome, welcome all to the

Complete Radio Shack Pro-2004 Mods file

Compiled from postings on rec.ham-radio
and other sources available

Some brief notes before we start. . . .

In response to numerous inquiries I am posting a overview of the mods to the Radio Shack PRO-2004 scanner. First, all mods are done at your own risk. I assume no responsibility. I do not know what effect they (the mods) will have on any warranty, however I would think they would probably void it. Also, one of the mods restores coverage of the cellular phone frequencies. It is ILLEGAL TO LISTEN TO CONVERSATIONS IN THIS BAND!

A> Read the following statement 1,000 times over

First treat the radio as if it were CMOS, that is make sure you and it have no built up static charges. UNPLUG THE RADIO FROM THE AC OR DC POWER SOURCE AND ANTENNA!!!!!!!!!! Be sure to handle the sub-assembly board and cable connector CN-501 with TLC, since even the slightest damage or minor crack in the board will result in a scanner good for use as a boat anchor.

B> Before doing anything else . . .

Take the radio out of the case by removing the 4 screws on the back. Carefully invert the radio.

C> Lets wrangle with a few diodes

Locate a box-like sub-circuit. It's near the switch marked "restart". The sub-circuit should be marked PC-3. Carefully pry off the cover of the metal box. Inside there will be a 64 pin dip IC. This is the radio CPU. Be careful not to touch or short out any leads on the chip.

The following diodes will determine how your scanner will work.

D-510 in circuit - scanner will have 400 memories (10 x 40)
removed - scanner will have 300 memories (10 x 30)

D-512 in circuit - it will step 30kHz from 825-844.995 and 870-889.995
removed - it will step 12.5kHz from 825-844.995 and 870-889.995

D-513 in circuit - will not scan 825-844.995 MHz or 870-889.995 MHz
removed - will scan all of 800 MHz band

D-514 in circuit - scanning rate increases to 20 channels per second
removed - scanning rate in 16 ch/sec (alt 8 ch/sec)

!!!! WATCH POLARITY !!!! If you cannot find a location, count backwards from a known location.

D> Turbo Scan-Another way

Turbo scan for the 2004??? Yes!! Someone has realized that if you replace the present 7.37 MHz ceramic resonator CX501, with a 10.7 MHz ceramic resonator it really boosts the scan/search speed! The present resonator is soldered between pins 29 and 30 of the CPU (IC-503). Rumor has it that a 10.00 MHz computer xtal will work just fine.

Jacque (KA9FJS) confirms that the mod works with an ordinary 10 MHz computer crystal (\$1 at hamfest) but reports a possibly-undesirable side effect:

Increasing the clock rate decreases the resume-scan delay time. Jacques says: "The manual says delay is 2 seconds; with mod, delay is <1 second. Painful if a channel is filled with slow responders." He reports no detection problems at the increased scan rate.

E> The Squelch Mod

Now, locate a sub-circuit box under the sloping front panel. It should have many alignment holes in the top. Pry the cover off very carefully. Locate IC-2 in the left side of the pc board. It should be marked IC-10420. Locate R-148, a 47 K ohm resistor between pins 12 and 13. Cut a lead of this resistor, But be sure to leave enough lead on both sides of the cut to solder to. Patch in a 100K ohm resistor. Make sure there are no solder balls or short circuits. Now your squelch will operate more smoothly.

F> The S-meter mod that doesn't work

1 - Locate transistor Q-9 (far front right area of the radio, just under the sloping front panel.

2 - Drill a 1/4" hole in the rear chassis of the radio.

3 - Install a RCA jack in this hole.

4 - Install on lead of a .10-uF ceramic disc capacitor to the center lug of the RCA jack and the other lead to ground lug of the RCA jack

5 - Clip off all but 1/4" of leads of a 10-K ohm resistor. Carefully, solder one lead to the collector (center lead) of Q-9. PRETIN ALL LEADS AND USE A LOW WATT IRON WITH SHARP TIP!!!

6 - Solder a 12" wire to the free end of the 10-K resistor. Slip a 1" section of insulated tubing over resistor and wire to prevent shorting.

7 - Connect free end of the wire to the center lug of the RCA jack.

8 - Connect a voltmeter capable of reading between 1 and 3 volts, DC (digital or analog to a RCA plug. Red wire to center, and black wire to the shell. Shielding in not needed.

Connecting the RCA jack and plug will now give you a measurement of the receivers intermediate frequency automatic gain control (IF AGC) the author said the range will be between +1.87 volts DC with no signals present to +2.6 volts DC for a strong signal. He also suggested that a digital voltmeter with 2 or three decimal places gave better resolution.

Brace yourself for disappointment - the integrated circuit mentioned for the S-Meter modification is used for WBFM only. Despite the internal IC block diagram in the service manual, pin 10 on my PRO-2004 is useful as an S-meter output only when the radio is in the WBFM mode.

Between pin 10 and ground, I placed a 10,000 ohm resistor in series with a 250 microamp meter for a simple test setup. The meter read full scale on strong signals. With no signal at all, the meter read about 70% of full scale. When the mode is set to AM or NBFM, the meter was always at zero.

One could add a bridge circuit here, but this metering point is of limited utility.

G> A carrier operated light

With a room full of functioning scanners, it's difficult to determine quickly

which radio is "talking." I use separate external speakers on each radio, and the spatial separation helps.

In addition to "hearing" which radio is active, I like to "see" which radio is active, and carrier operated lights are effective at providing such visual cues. The idea is to illuminate a lamp when a signal opens the squelch. A small yellow light emitting diode (LED, another Bell Labs invention) is well suited to this purpose. The following modification works well on all PRO-2004 modes.

To add a COR light to the PRO-2004, make use of the "scan control" pin (pin 13) on IC2, the TK10420 IC. Pin 13 has voltage present only when a signal is detected. This chip contains the IF, detector, limiter, and squelch circuits for NBFM.

If you tremble with an electric drill in your hands, read no further. The LED can be mounted in a small hole drilled through the plastic front panel, just to the right of the headphone jack.

Electronically, the circuit is simple. The voltage at pin 13 is not enough to drive the LED directly, so a general purpose NPN transistor (e.g., a 2N2222) can be used as a solid state switch.

- Pin 13 of IC2 is connected to the transistor base through a 10,000 ohm resistor.
- The emitter is grounded.
- The collector is connected through a 1000 ohm resistor to one end of an LED. This resistor limits the LED current to about 13 milliamps.
- The other end of the LED is connected to one contact on the rear of the PRO-2004's on/off, volume control. This furnishes about 14 VDC unregulated to the circuit. The back of the on/off switch has two contacts. Use the one with the brown wire connected to it, as this contact is only "live" when the scanner is turned on.

I mounted the 2 resistors and transistor on a small PC board, which I fastened to the PRO-2004 chassis using a metal standoff.

H> A Tape Relay

This mod works on the same principle: you use the same pin (13?) on the IC that you normally use for the carrier detect light, but instead of a light being used, I used a small low-current relay. Connect the primaries of the relay in place of the light. You will have to determine the proper resistance to wire in series, if necessary. Then connect the secondaries to the tape recorder's "remote" jack. Depending on your tape recorder, you may need a normally-open relay or a normally-closed. For mine, I used a very small normally-open relay that draws about 50 ma at 12VDC that I got from one of the mail order houses (Jameco, I think).

By the way, I have both the relay and the LED hooked up. I use the 2N2222 as the solid-state switch for the circuit. I also put diodes in line coming from the IC to the base of the transistor as well as one coming into the collector of the transistor just for safety sake.

I> Finally. . . .

Make sure you re-install the metal cover and re-install the radio in the case!!!!!!!!!!!!!!!!!!!!

J> Sources

PR2004.txt

These mods are detailed in the following articles:

- a) Popular Communications-August 87, PP 18-20
- b) Popular Communications-December 88
- b) Monitoring Times-October 87, Page 53
- c) Monitoring Times-December 87, Page 60
- d) Monitoring Times-July, 88, Page 93

Addresses: Popular Communications	Monitoring Times
76 N Broadway	140 Dog Branch Road
Hicksville, NY. 11801	P. O. Box 98
	Brasstown, NC. 28902
	(704) 837-9200

Also credits from the various posters. . .

Tape Mods:

Jeff DePol o - N3HBZ University of Pennsylvania Computer Science Engineering Class of 1991	Via the Net: depolo@eni.ac.seas.upenn.edu Electromagnetic: 147.225/224.980 in Denver The Old Fashioned Way: (303) 469-1078 home (303) 469-7765 work
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Carrier Detection Light:

Bob Parnass AJ9S, AT&T Bell Laboratories - att!i huxz!parnass - (312)979-5414

Other Mods:

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And, of course, your gracious compiler . . .

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