



HT220

PRESERVATION SOCIETY

NEWSLETTER

THE PORTABLE CLINIC

Robert Hicks was famous for HT220 mods and accessories has resurrected his company at www.theportableclinic.com. The photo gallery includes Bob during his years at Motorola, other 220 engineers, HT220 and HT200 repair girls, and pages from his catalogs. Most useful are high density scans of schematics for downbanding HT220s and scanning circuits. Check it out! ❖

DOWNLOADABLE HT220 NAMEPLATE

You can download a HT220 nameplate from www.batnet.com/mfwright/nameplate.html. Bring this up on Photoshop then reduce its size, print it out, place a good quality packing tape over it and by using Scotch spray adhesive, it should look pretty good as the replacement logo.

Print the HT220 logo tag on metallic paper I pick up at Michaels (art supply) in Sunnyvale. Looks great. Unless you inspected it carefully when mounted on an HT220, you can't tell it from the original.

Print the logo, cover it in packing tape, cut it out, trim it, and mount it with Scotch Photo mount. ❖

TUNING THE HT-220 "HANDIE TALKIE"

Selecting frequencies on a HT-220 is not like selecting frequencies on today's handhelds where you punch in the desired frequency on a keypad. The HT-220 has to have a crystal.

The HT-220 is a crystal-controlled radio and requires a crystal for each frequency, one for transmit and another for receive. A 2-channel unit will need another set of crystals. The crystal will have to be changed if a different frequency is desired. This is why the HT-220 is limited to 6-channel maximum because it is size limited to how many crystals it can hold. The transmitter and the receiver will have to be aligned for each frequency by tuning associated components (coils and capacitors).

Unless you are rich and can afford someone else to do the work, you have to get crystals for the HT-220 as they did in the old days, LIKE MEN! This means going to the quarry (hiking 20 miles through the snow even in the summer), bust rocks until you get a adequate amount of quartz to grind the crystals, and then hiking back (it's uphill both ways!) to your shop were you have to spend long endless nights painstaking grinding the quartz to the precise thickness so the crystal vibrates at the exact frequency you want. Kids these days...

Well, it is not this bad. You can order crystals to the desired frequency from either ICM (<http://www.icmfg.com> or 1-800-725-1426), Bomar at <http://www.bomarcystal.com> or 1-800-526-3935, or Peterson Radio at (712) 323-7539. ICM will calculate the actual crystal frequency for the operating frequency you specify for the HT-220. Cost is typically \$15 and delivery is about 2 weeks. After soldering the crystal in place, you still need to tune the radio for optimum performance.

Now you may be asking "ain't this the same techniques Guglielmo Marconi and Charles Herrold used on their radios?" This is why the current market price of the HT-220 is so cheap. You must be technically competent in RF circuitry, and willing to put in the effort to make it operational (most people will not). Tools required are a finetip soldering station, needle-nose pliers, small snips, tuning tools, and test equipment. Other things such as de-soldering tools and a test jig (recommended) to hold the chassis in place during servicing.

Some years ago, the FCC stated that radio transmitters may be tuned or adjusted only by persons holding appropriate radiotelephone operator's license. But these days, brain dead people can perform whatever is required for adjustments outside the factory since virtually all 2-way radios are computer-programmable with no servicable parts. However, an FCC license is still required for servicing aircraft and marine radios. ❖

HT-220 ACCESSORIES AND BATTERIES**Batteries**

- NLN4462B: Dual Charge Ni-Cad Battery, Slim Line Housing, current edition (275 mAH)
 NLN4463B: Dual Charge Ni-Cad Battery, Omni Housing, current edition (550 mAH)
 NLN8232B: Dual Charge Ni-Cad Battery, Omni Housing, current edition, intrinsically safe (550 mAH)
 NLN6682A: Standard Charge Ni-Cad Battery, Slimline Housing
 NLN6761A: Standard Charge Ni-Cad Battery, Omni Housing
 NLN6900A: Rapid Charge Ni-Cad Battery, Omni Housing
 NLN6683A: Mercury Battery, Slimline Housing
 NLN6762A: Mercury Battery, Omni Housing
 NLN6936A: Mercury Battery, Omni Housing (newer version)

Chargers

Note: The NLN6804 uses type 1829 lamp (charge light, on left side) and type NE51H neon lamp (trickle charge, on right side). Lamps should be steady on when selected. The regular omni charge current is 80 mA and the trickle charge current is 3 mA. Lamps need to be lite (and working) for a proper charge rate. Also, the NLN6804 charger uses a 0.2A, 125V fuse. This also may be applicable for the NLN6684 charger. You can get lamps for the chargers at Allied Electronics, <http://www.alliedelec.com> or call 1-800-433-5700

#1829 lamp, catalog number 749-9625, pkg of 10 at \$7.55

#B2A(NE51H), catalog number 749-2125, pkg of 10 at \$10.10

- NLN6684A: Single Unit Charger, Standard Charge, Slimline Housing
 NLN6804A: Single Unit Charger, Standard Charge, Omni Housing
 NLN6897A: Single Unit Charger, Rapid Charge, Omni Housing
 NLN6691A: Vehicular Charger, Standard Charge, Slimline Housing
 NLN6892A: Vehicular Charger, Standard Charge, Omni Housing
 NLN6774A: HT200 Charger Insert Conversion to accept HT220, Slimline Housing
 NLN6776A: HT200 Charger Insert Conversion to accept HT220, Omni Housing
 NLN6685A: Multiple Unit Charger, Standard Charge, Slimline Housing
 NLN6756A: Multiple Unit Charger, Standard Charge, Omni Housing
 NLN6898B: Multiple Unit Charger, Rapid Charge, Omni Housing

Antennas

	Frequency	Color Code	Heliflex Model
NAD6262A: Antenna, telescopic, 136-162 MHz	136-142	Yellow	NAD6221
NAD6211A: Antenna, telescopic, 162-174 MHz	142-150.8	Green	NAD6222
NAD6221A: Antenna, heliflex, 136-142 MHz	150.8-162	Black	NAD6219
NAD6222A: Antenna, heliflex, 142-150.8 MHz	162-174	Blue	NAD6220
NAD6219A: Antenna, heliflex, 150.8-162 MHz			
NAD6220A: Antenna, heliflex, 162-174 MHz	406-420	Red	NAE6100
NAD6215A: Antenna, rigid loop, 136-174 MHz	440-470	Green	NAE6142
NAD6212A: Antenna, flexible wire, 136-174 Mhz	470-512	Black	NAE6143

Remote Earpieces, Speakers, Mics

- NMN6042C: Remote Speaker/Mic, Coiled Cord (for Remote Models)
 NMN6041C: Remote Speaker/Mic, Straight Cord (for Remote Models)
 NMN6049C: Remote Speaker/Mic, Coiled Cord (for Universal Models)
 NSN6008A: Lapel Speaker with subminiature phone plug
 NSN6011A: "Secret Service" styled earpiece and volume control with subminiature phone plug

Carrying Cases

- NLN6777A: Carrying Case and Full Cover, Carrier Squelch Internal Spkr/Mic
 NLN6845A: Carrying Case and T-Cover, Carrier Squelch Internal Spkr/Mic
 NLN6761A: Carrying Case and Full Cover, Carrier Squelch Remote Spkr/Mic
 NLN6846A: Carrying Case and T-Cover, PL Squelch Internal Spkr/Mic
 NLN6761A: Carrying Case and Cover, PL Squelch Internal Spkr/Mic
 NLN6761A: Carrying Case and Cover, PL Squelch Remote Spkr/Mic
 NLN8423A: Omni Housing Back Cover with Belt Clip, Carrier Squelch
 NLN8424A: Omni Housing Back Cover with Belt Clip, PL Squelch

HT-220 BODY ALARMS

by Steve Uhrig, WA3SWS, SWS Security

Some interesting HT220s were designed as body alarms for prison guards, executive protection, attendants in loony bins and people like that. They are slimline VHF HT220s with bright red plastic. No receive circuitry in them as far as I know, or at least they draw zero current. The bright red color makes them very unique looking. The **only** control on them is a shrouded momentary push button on the top of the radio. The PTT switch bar does not do anything. No power switch. There also is a shrouded red indicator light on top of the radio, viewable only by looking straight down at the radio on your belt.

An officer in trouble presses the momentary switch. On some radios, a squeal sounds in the portable's speaker. On some, it is silent. I don't know if these are defective or if the squeal is an option. I believe the squeal is to assist nearby officers in physically locating the officer who tripped the alarm.

The squeal lasts about 10 seconds, then a local mic on top of the radio kicks in and transmits nearby audio for about 50 more seconds. During the audio transmit period, the red indicator stays lit. At the end of the timed period, the radio drops out of TX and the red indicator light goes off. Apparently the indicator is designed so no one other than the wearer of the radio can see if it is transmitting or not.

There is a companion receive console, built like a tank, extremely heavy gauge metal, absolutely super solid, far more than any other radio gear I have seen from Motorola or anyone else and I date back to the 80D mobile days with 60 amps at 6 volts for 30 watts out on low band. The receiver weighs perhaps 40 lbs.

The base station is perhaps rack width, and about 8 inches high. It has a captive 3 wire power cord on the back, fuses for line, +15VDC and -15VDC, and an SO-239 for the antenna. On the front on the right is a small control panel with a Sonalert, small volume and squelch knob like on the HT220, a monitor on/off toggle switch and indicators for both DC voltages.

On the left are windows in 3 columns of four deep where you can write a legend for a particular channel such as a unit # or an officer's name. Each is backlit in red, and there are 12 of them. Next to each indicator is a push switch for test and reset. Some of them are momentary and some are push on/push off. I don't know why some are different.

If an officer triggers his radio, the Sonalert sounds and the appropriate indicator backlight comes on and stays lit until reset with the pushbutton next to it. The audio is heard through the local speaker. The system I

have seems to work except there is low RX audio and a lot of humm on the audio which I would expect from dried out electrolytics after 30+ years.

I don't know the coding used to differentiate the various radios. All are on the same RF frequency of 160 or 170-something megacycles (I forget) which probably means they came out of federal service.

I have one receiver/alarm console, 12 portables, moldy holsters and a thoroughly beat up antique 12 slot rack charger with the toggle switches for standard or trickle charge. Four of the 12 radios I have are coded to the receiver and they trip the receiver properly. I hope to learn how to recode the receiver or portables to all match so I can put together a complete working 12 channel system.

My company does tech support for executive protection teams, amongst other things, and I had hoped to put this system back in service. The receiver, especially, is so beat up, however, I will not be able to use it professionally. I'll probably fix it up as a labor of love and sell it to someone. I've got too much in the system to toss it in the trash, and I doubt anyone would want it for its original purpose unless working.

I don't know how popular MOTOROLA body alarms were. In my law enforcement career I never saw them in prisons, although there were plenty of the nearly identical systems manufactured by Audio Intelligence Devices aka AID, for much higher prices undoubtedly. I could shoot some digital photos of the receiver someday if you don't have those. I allegedly have a manual coming, and maybe a scan would be better.

The local state loony bin used garage door openers, actually a commercial version made by Transcience, now probably out of business. 330 megacycles, short range especially indoors. They more hung on walls in offices than were carried. Multiple receivers tripped lights and Sonalerts in nurses' stations in adjacent wings. They relied on many receivers for coverage rather than transmit power.

Seems like UHF would have been a better choice for these panic alarms. Smaller antenna, better penetration of buildings, etc. Maybe the VHF versions came out first and the special configuration was developed early on in production.

In 1997-98, Steve Uhrig was the technical advisor on electronic surveillance to the Disney-Touchstone political techno-thriller movie "Enemy of the State" featuring Gene Hackman and Will Smith. Steve also had an acting part in the movie, which was released in November of 1998. ❖

CLEANING HT220 BATTERY CONTACTS

By Bill Mercer, HT220 Enthusiast, WB6FEH

Corrosion of the contacts inside the radio can be a real problem, especially if the battery has been overcharged inside the radio. The corrosion is mainly caused by out-gassed electrolyte from the ni-cd pack.

This procedure is best done with the front cover removed from the radio. Carefully remove it, following the steps from the manual. Be sure to make note of the locations on the PC board where the B+ (red), common (black), mic (white), and spkr (blue) wires connect, so these wires can be re-connected to the right terminals.

Supplies Needed:

Old, soft toothbrush
 Small, stainless steel parts brus
 OR, Dremel moto-tool with miniature wire brush tip
 1/4" straight-blade screwdriver, with a DULL edge
 Isopropyl alcohol and water mix (rubbing alcohol)
 Swabs, cotton
 Typewriter eraser (pencil type)
 Masking tape
 Safety glasses

First, use the toothbrush to remove any loose, white deposits. Mask off the plastic areas around the metal contacts. Lay the front cover face-down on an old terry towel. If there are heavy, solid deposits, CAREFULLY scrape with the dull screwdriver to remove them. The object is to remove the bulk of the corrosion, not remove the plating from the spring-brass contact!

Next, use the Dremel with fine-point wire brush tip (OR, the SS parts brush if you don't have a Dremel tool) to polish all contact surfaces. Use light pressure, and keep the tool moving. Once again, you want to remove corrosion, not the plating. Be sure the edges of the curved spring areas are cleaned, too. When this step is done, the metal should have a fairly bright, silvery appearance.

For the final polish, use the typewriter eraser (you can sharpen it with a pencil sharpener to the desired point) to polish all the metal areas with a circular motion. The fine abrasive in the typewriter eraser does the trick. The contacts should be shiny now, with all the silvery plating intact.

Finally, remove the masking tape and clean up the white powdery residue with cotton swabs and rubbing alcohol. The old toothbrush may be needed to get into crevices. CAUTION: use of straight IPA (isopropyl alcohol) may cause the plastic to "bloom," leaving a whitish appearance! Not pretty! Re-assemble radio.

I've restored a number of "lost-cause" front covers in this manner to near-new appearance. Hint: I always charge batteries out of the radio and never store radios with batteries installed. If you have any questions, feel free to contact me at ht220_fan@hotmail.com.

73 de WB6FEH ❖

HT220 PERFORMANCE INCONSISTENCIES

By Mike Gibbemeyer, K1CW

Some of my HT220s are better receiver sensitivity than others. One is quite sensitive and another has really bad sound qualities. Any comments?

On your inconsistency with various boards, yes, back then there were variables that affected quieting and power outputs. One was the actual PC board that the components were mounted onto. Believe it or not, there have been times when a radio would not meet specs for quieting and after much time spent in troubleshooting, we found the main board to be defective (the board material separating the top and bottom traces/lands). It was contaminated and allowed RF coupling between the top and bottom circuitry. After a while, Motorola system-checked each and every board before parts were mounted. You could also make sure that current drain of an unquieted receiver is approx 70 ma.

Some receivers seems to have poor rf sensitivity when in reality the problem is an open bypass cap or lossy crystal filter.

The clue to many transmitter power problems is how each coil tunes, where the slug peaks. Most should peak from midway up to flush with the board. Anywhere else usually indicated a cap out of tolerance.

HT-220 Tech Help: Do you have a question or problem with an HT220 that cannot be solved with the information on this page? Ask Mike Gibbemeyer at Jurypowr@aol.com. He worked at Motorola performing acceptance tests of HT220s. ❖

Tuning Note: If the receiver sensitivity seems limited, examine the IF frequency. Ed Fong has found radios where the 2nd oscillator was off by up to 8 KHz and this will limit receiver performance. ❖

HT220 NEWSLETTER is published by the
 HT-220 Preservation Society
 Website: <http://www.batnet.com/mfwright/HT220.html>
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