WE'RE BACK!

Believe me, no rest during this past break, which really wasn't a break. I used the spare time to polish off my forthcoming new book, The *Ultimate Scanner*. It's all done now but the shouting, final edits, and a sip of the bubbly. I can't tell you much more about it at this sitting because the Publisher still has a monumental task ahead, but I am, however, prepared to make you dear readers a very attractive discount offer for *advance purchases* received before the date of publication. Here's the deal:

ULTIMATE SCANNER BOOK

The publisher has announced the list retail price of the *Ultimate Scanner* to be $29.95 effective July 1, 1995. Until then, the publisher's price is $24.95. For *advance orders only*, I will take it one step farther and set it at $21.95 + $4 S&H to **expire** on April 30, 1995.

For orders received between May 1 - June 30, 1995, the price will be $23.95 + $4 S&H: The price of the *Ultimate Scanner* on and after July 1, 1995 will be $29.95 + $4 S&H.

As usual, all *my* books sold by me will be *autographed* and shipped within 1-3 days ARO, except that we cannot ship the *Ultimate Scanner* until it's been published. That's why we're now accepting advance orders for a deep discount. Publication date and shipment is expected to be in early May, but we'll formally commit to *sometime* in the month of May.
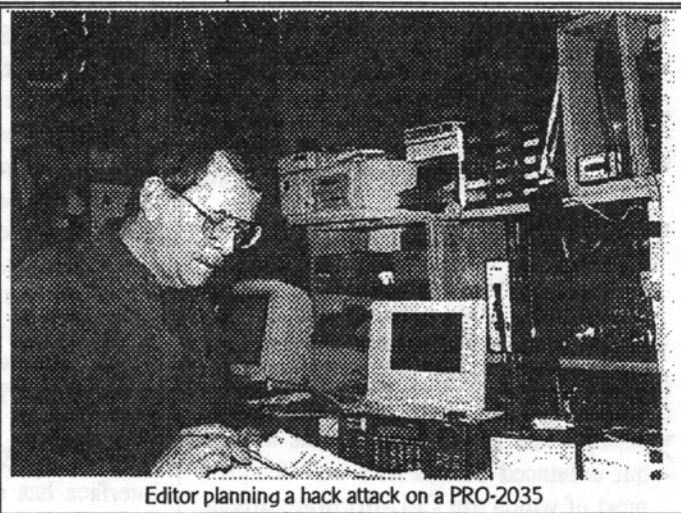
WHAT ELSE IS COMING DOWN?

The next month will be a low key period, chock full of hundreds of little details to cover. Lots of work to do and then I'm going to sit down for a long think about things and enjoy a peaceful, relaxing summer. I will be thinking about new directions for both the *World Scanner Report* and my next book.

I will be meditating upon and investigating the future of scanning and radio monitoring in general. You see, I think we are entering the end of an era. I think the curtain of an epoch act is coming down as a new "scene" gathers momentum to unfold. You deserve to know about it, if any such is in the works. You're not likely to hear about it in any other forum for the time being, and so I will be collecting my thoughts, observations, and facts to lay on you in the coming months.

I do not anticipate any monumental, earth-shaking revelations, either on the technical scene nor out there on the monitoring scene for these next few months. I foresee a lengthy lull before the storm, and I expect this lull to lazily wander through our lives for the remainder of 1995.

Am I being cryptic here? I'm sorry, I don't intend to be. It's just that I have a million things on my mind, and about 90% of them have a potential impact on our future. I could be wrong on some; I will be right about some; and some will probably remain unproved, either way. It's hard to discuss the facts when you're

Editor planning a hack attack on a PRO-2035

not sure of the difference between fact and fiction. That's my dilemma, but let's consider *some* facts as we know them:

FACTS & NOTES

1. A host of easily modified, easily re-engineered scanners hit the market between 1980-1994. These scanners are earmarked by a maximum of hardware and performance with a minimum of firmware or software. You remove the case of these scanners and stare down into a maze of components in such grand profusion that even the technical mind is easily bewildered at first.

2. Don't nail me down on this, but the cellular mobile telephone industry was conceived in the late 70's and was a viable embryo by 1980, give or take.

3. By 1986, the cellular telephone industry had amassed sufficient power and resources to ram through Congress the nasty Electronic Communications Privacy Act, that forbids monitoring cellular phone conversations.

4. Last year, icing was smeared on the cake with passage and implementation of the Telephone Disclosure and Dispute Resolution Act, Public Law 102-556, of 1994, a rider of which forbids the

importation and manufacture of cellular-capable and easily cellular-modified receivers, effective 4/1/94.

5. With rare exception of a few older models, all Uniden scanners are basically empty boxes with a few chips scattered around, controlled by a fat CPU that does all the work. (*Firmware*)

6. Several years ago, Uniden bought out Electra-Bearcat and the Regency scanner division, and thereby gained ownership of a majority of all scanner patents. Uniden promptly sued ICOM over a patent infringement!

7. With exception of the new PRO-2035 and a current model of the PRO-43, all scanners released by the "giants", Uniden and Radio Shack, after 4/1/94 are your basic CPU-controlled empty boxes. The PRO-2035 remains an old, but enhanced design with new features, most of which are CPU-firmware driven. Nice, but the PRO-2035's *performance* comes from its PRO-2004/5/6 heritage; not from the firmware.

8. On a slightly offbeat note, take a look at the new Uniden BC-9000XLT, replacement for the BC-8500XLT. Wow! *What a whopper!* Good grief, you believe that, and I have some nice Everglades property to sell you. Aw, the derned thing isn't exactly a piece of junk though it is within my editorial rights to call it whatever I want. But first one of you dudes to get one.....remove the case and tell us what you see inside! Space. That's what will be there. Space...air.

ED Note: The thing that's wrong with this picture is the intentional illusion of grandeur & magnificence of the contents of these scanners. Space age looks, coupled with a seemingly awesome array of features and benefits in Uniden's top line scanners conveys an impression. You are led to believe there is something under the hood. You wouldn't expect to find a Volkswagen Beetle engine under the hood of a Peterbilt semi-truck, would you? Or .22-cal bullets in a .457 magnum, eh? Or beer in a bourbon bottle? Or rat meat hamburgers down at McDuck's?

I didn't mean to editorialize this early in the game, but I didn't want to lose anyone this early, either. I'm just laying

out a series of facts with as little discussion as possible for the moment. People are sometimes offended when I render negative opinions on scanners, and this is not my intent. Facts and brass tacks are my mission for the next several months, ok? You can't get mad over a fact. Now read on.....

9. As far back as 1986, John Leavens of CardKit Electronics was fighting Uniden over their "flatpacking" design techniques for CB radios, where most everything was contained on a chip or two. *So it's not just me who will tell you Uniden radios are hollow........I don't* know what became of John and CardKit over the years. We drifted out of touch when I left the CB scene in '87. Anyone know if he is still around, or maybe wearing concrete overshoes at the bottom of Mobile Bay??

10. The CE-232 Scanner/Computer Interface has not been reviewed by any leading hobby radio magazine or periodical, even though I asked two!

11. The CE-232 Scanner/Computer Interface was reviewed in two leading **professional trade magazines** without being asked (*and won a major award in one trade rag as the leading Reader Service Card draw for that month!*)

12. A new publisher on the radio scene was rudely treated in the Nov-93 issue of "*Monitoring Times*" in Larry Miller's (*What's New* column, pg 90) scathing book review of *Scanners & Secret Frequencies* by Henry Eisenson.. There was no merit in that slam-dunk review, especially in light of (13) below. It's just that both the publisher and the author were new to the hobby radio scene, and were unknowns at the time, apparently ripe for a crude and rude initiation rite.

13. *Good ol' Boy* publishers are never rudely treated in the major hobby radio magazines, even when their books are a downright mess, in which case the materials are either not reviewed at all, or are glossed over.

14. **Contest Time!!** I want you guys to dig up this **next fact**, so that I won't have to be the one to spill the beans. It's subtle and it's slick and if you subscribe to or can get a copy of the Mar/Apr 1995 issue of "*National*

Scanning Report", then you can WIN a free 6-mo subscription or extension to your subscription to the *WSR* just for reporting the correct answer. We will make the award to the first three most correct replies received not later than 2400 hrs, April 30, 1995 via any form of e-mail or US Mail or Fax as follows:

CompuServe:	74107,1176
InterNet:	bcheek@cts.com
FidoNet:	1:202/731
Hertzian BBS	(619) 578-9247 See masthead
Fax:	(619) 578-9247 See masthead
US Mail:	PO Box 262478
	San Diego, CA 92196

Ok, here's the deal. The Mar/Apr-'95 issue of "*National Scanning Report*" (and a number of preceding issues) contains a very specific, very unique, singular fact that stands out by omission more than visibility. Find & report that fact to win.

Hint 1: *It's what's **not** there......*
Hint 2: It occurs **exactly** twice somewhere on pp 25-28 of the Mar/Apr-'95 issue of the "*National Scanning Report*"
Hint 3: This fact, while expressly related to the Mar/Apr-'95 issue, is not limited to that issue, but I don't know what pages it occurs on in other issues, nor in which issues. This singularly *odd* fact is clearly revealed in the Mar/Apr-'95 issue and somewhat subtly so in various back issues of the "*National Scanning Report*" in the section of the magazine that advertises **DX Radio Supply's** publications for sale.

CHALLENGE: State the fact in so many words or less to qualify. Winners and their responses will be published in a forthcoming issue. Confidentiality is assured for those who request it.

Note: Decision of the judge (me) will be arbitrary, capricious, and final, but I will make the award to at least the first three winners, except that an award will be made to at least one winner in each of the e-mail, fax, BBS, and US Mail categories so as to give everyone a chance. Therefore, I may award more than three winners. How many more is up to me. Arbitrary, huh? ☺

15. *The Information Age* is upon us! It started in an embryonic form back when broadsides, smoke signals, and jungle drums were the primary media of

communications over distance. The Information Age was born with the advent of the locomotive, telegraph, telephone, and Pony Express. It entered childhood with the invention and implementation of radio. And now, "Childhood's End" gives way to adolescence as radio becomes a less used and less important avenue for communications.

OK, that's enough for now, guys. This gives you something to think about for the next few months. We'll dig deeper and perhaps have an open dialog on what the future holds in store. Meanwhile, your thoughts, editorials, and predictions will make good fodder for these pages, so fire away at me, either about what I think or about what you think. Or both.

UPDATE
PRO-2004 Parts Are Gone!

Last issue, we reported that PRO-2004 parts might soon dry up at the Tandy National Parts center. *Might*, hell! They *are* gone, so report several of our readers. At least the crucial stuff like EL panels and maybe the Service Manuals are gone. Let us take a moment to shed a tear and lament the passing of an era.

And then, I suppose we could fight! First, understand that the PRO-2004 went off sale back in May, 1990, about five years ago. Most manufacturers, and Tandy, I think, pretty well commit to maintain a spare parts inventory for a period of five years after a major item leaves the shelves. Tandy *more or less* fulfilled their commitment, shave a couple of months. That could be argued on technicalities, I suppose.

So what to do? I dunno..... I laid in a small supply of the more crucial stuff for my PRO-2004 a couple of years ago...EL panels, front panels, CPUs, and maybe a couple of other things. So I am "fixed" for a while. Those of you who would like to replace your front panels or the degradable EL panel, maybe should call Tandy Parts (800) 442-2425, and place an order. When you're told "there ain't no more", register a protest and ask to speak to a supervisor. Plead your case and ask WHERE can you get these

needed parts if Tandy won't handle them anymore. If enough of YOU do that, your voice might have some 'carry' to it.

The PRO-2004 isn't starved for electronic parts (*generic parts or PRO-2005/6 equivalents are fine*), so much as the things that just wear out....again, EL panels, front panels, keyboard panels, service manuals, etc. For the most part, I think we're just out of luck.

There is no hope for damaged front panels aside from a dip in solvent; polishing, buffing and hand-lettering. The EL panels from the PRO-2005/6, while a bit smaller than the PRO-2004's, *will* work. Might not look good, but they will provide a backlight for the display.

Another idea for a replacement backlight would be a frosted glass or plastic "slide" kind of like a microscope slide, just the size of the old EL panel, so it can slip in behind the display. Then a series of small incandescent "wheat lamps" or LEDs could illuminate the slide which would diffuse the light enough to make the appearance pretty good. Frosted glass slides are probably out of the question, but what about stiff, translucent plastic sheets? Anyone know of a source of "frosted plastic"?

It's probably unreasonable to ask a manufacturer to stock spares for an indefinite period, so what are other options to prolonging the life of the PRO-2004? Anyone have any ideas?

Meanwhile, let experience be a teacher and stock up on critical spares for your PRO-2005's and 2006's if you know what's good for you. Same with your other scanners from yesteryear. If they've been off sale by three or more years, you better either start planning your spare parts inventory or peddle the dern thing as soon as you can. Words to the wise.............

Spare parts planning involves a careful analysis of the schematic diagram and parts lists, noting the things that are generic and those that are unique. In general, you need knobs, plastic cases, controls, belt clips, and the things that can break or wear out. Also spare battery holders are a good idea..... ☻
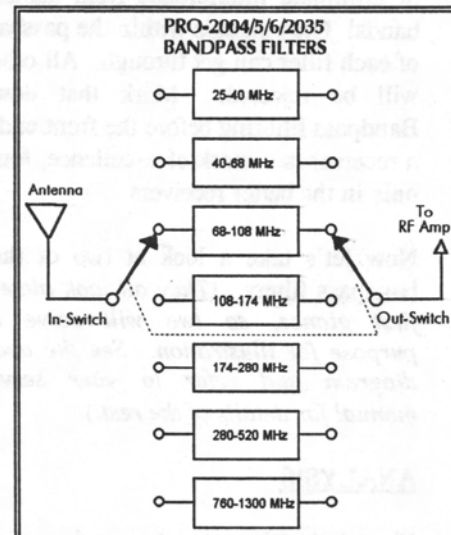
BANDPASS FILTERS
PRO-2004/5/6 & PRO-2035
Explained

Bandpass filters are a much overlooked performance commodity in today's scanners. Pity only a few scanners have them. The PRO-2004/5/6, PRO-2035 and the PRO-43 are among those that do. The Uniden BC-8500XLT and BC-2500XLT have mediocre excuses for bandpass filters, but too bad they don't have better ones and the other things that go to making a great receiver.

So what's a bandpass filter, anyway? Think of it as a switch and a specially designed "gate" that admits a band of frequencies while rejecting all others. Below is a block diagram of the bandpass filters used by the PRO-2004/5/6/2035, which should clarify the idea:

PRO-2004/5/6/2035 BANDPASS FILTERS: 25-40 MHz, 40-68 MHz, 68-108 MHz, 108-174 MHz, 174-280 MHz, 280-520 MHz, 760-1300 MHz — Antenna, In-Switch, Out-Switch, To RF Amp
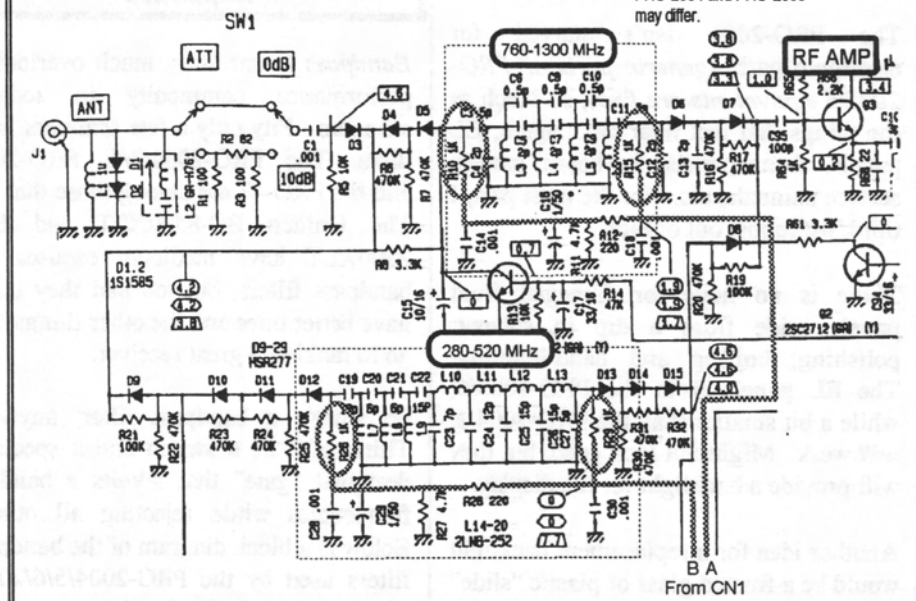
Operation of the bandpass filters is simple: it's *automatic*, done by the CPU, that senses the active or selected frequency at all times, and makes sure the "switch" is set to the proper filter. This switching action takes place in a few microseconds every time the scanner's frequency is changed, no matter the mode: *Manual, Scan or Search*. It doesn't matter, the mix of frequencies, the correct bandpass filter is always active within a few millionths of a second of the frequency being selected.

Suppose you are listening to a NOAA weather station on 162.550 MHz. The above bandpass filter scheme ensures that signals no lower than 108 MHz nor above 174 MHz can get into the RF Amp of the receiver! This serves to minimize

PRO-2004/5/6/2035 B.P.F. & FRONT END

PRO-2005/6 Shown. Circuit symbols for the PRO-2004 and PRO-2035 may differ.

SW1 · ATT · 0dB · ANT · RF AMP · 760-1300 MHz · 280-520 MHz · B A From CN1

or eliminate interference from adjacent bands! Only signals within the passband of each filter can get through. All others will be rejected. Mark that down! Bandpass filtering before the front end of a receiver is a mark of excellence, found only in the better receivers.

Now let's take a look at two of these bandpass filters. (*They all look alike at first glance, so two will serve the purpose for illustration. See the above diagram and refer to your service manual for details of the rest.*)

ANALYSIS

First, let's take a quick overview of the front end, in general. Signals from the antenna enter at J-1 and immediately pass coil L-1, a shunt for DC and static buildup on the antenna, but which has no effect on RF signals. Next, there are D-1 and D-2, a series diode safety shunt that does nothing unless RF or surges on the antenna are strong enough to overcome the forward bias levels of the diodes at about 0.6v each for 1.2v total. In other words, these two diodes will conduct to clamp or limit the input of RF and spikes to not more than 1.2 volts on to the front end. *L-1 and D1-2 are safety valves.*

Next the signal encounters L-2, an adjustable matching filter, probably to set the input impedance of 50Ω. If you have an S-meter, you can adjust L-2 for maximum signal in mid-range of the scanner, say around 400-500 MHz.

Then we come to the Attenuator switch, that in one position (0-dB) is a straight-thru path into D-3. The -10 dB position routes the signal through R-2 to create a 10 dB loss.

D-3 is the first diode switch but it's turned ON anytime the scanner is on. I suppose it is kind of a safety gate for the RF Amp when the scanner is turned off.

The signal out of D-3 hits a "Y", one direction into D-4 and the other into D9, both basically more master switches for the bandpass filters. D4 feeds D5, the In-Switch for the 760-1300 MHz BP filter while D9 feeds the individual diode switches for the remaining six BP filters, including D10-D12, the In-Switch for the 280-520 MHz BP filters.

Now this is where things get exciting, if you're into BP filters. Note the two BP filters shown above that are enclosed within dotted boxes for clarity. And remember that only one BP filter can be on at a time. This is accomplished by the heavy gray lines that show the switched +5v that turn on and off the individual BP In/Out Switch diodes. Only one of these gray lines (A or B) will be at +5v at any given time. Let's assume that the CPU has placed +5v on Line B...in which case there is 0v on Line A. Back to Line B, that +5v is fed to the two circled resistors, R26 & R29, which pass the +5v to the anodes of D12 and D13, respectively. +5v on the anodes of these diodes turns them ON
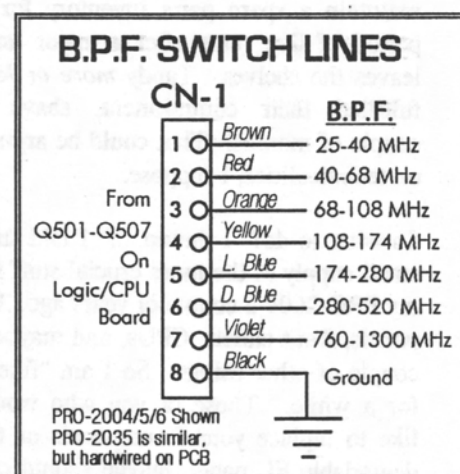
allowing a conductive path into and out of the filter. Meanwhile, over on Line A, there is 0-v on the anodes of D5 and D6, which shuts them OFF, thereby preventing signals from getting through the 760-1300 MHz BPF.

If you can't see it, the current path for D12 is up from ground through R26 into the cathode of D12; out the anode and down through R26 & R28 to the +5v feed at B. Likewise, the current path for D13 is up from ground through R30 into the cathode of D13, down through R28 to the feed at B. I won't explain any more of the diode current paths because they're all the same. Look closely at your schematic in the service manual.

Completing the signal path analysis, a signal that enters D12 emerges from the filter at D13 with almost no loss provided it is between 280-520 MHz. Signals outside that range are highly attenuated by the filter. The desired signal leaves D13 and passes through D14, D15, and D8 to pass through C95 to the base of the RF Amp for further processing. The remaining five BPF's all work in the same fashion as described here, so the next level of discovery is the neat switching method for the bandpass filters, the feedlines of which are the 8-pin CN-1 (ground & 7 switch lines).

BPF SWITCHING

Following is an illustration of the switch function for each pin/line of CN-1:

B.P.F. SWITCH LINES

CN-1

From Q501-Q507 On Logic/CPU Board

Pin	Color	B.P.F.
1	Brown	25-40 MHz
2	Red	40-68 MHz
3	Orange	68-108 MHz
4	Yellow	108-174 MHz
5	L. Blue	174-280 MHz
6	D. Blue	280-520 MHz
7	Violet	760-1300 MHz
8	Black	Ground

PRO-2004/5/6 Shown PRO-2035 is similar, but hardwired on PCB

As intimated previously, the BPF switching signals are originated by the CPU, specifically from Pins 42, 43, & 44, a function called the RF Switch. These three output pins form a binary number that varies as shown below:
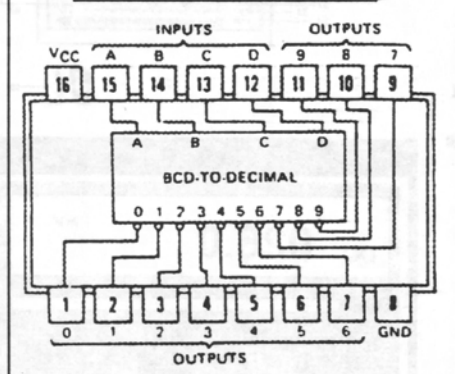
CPU B.P.F. CODE

FREQ RANGE	CPU Pin #		
	44	43	42
25-40 MHz	H	L	L
40-68 MHz	L	H	L
68-108 MHz	H	H	L
108-174 MHz	L	L	H
174-280 MHz	H	L	H
280-520 MHz	L	H	H
760-1300 MHz	H	H	H
H= High, +5v L= Low, 0v			

BPF SWITCHING CIRCUIT

In other words, the CPU outputs logic levels on the above pins at all times the scanner is turned on. These binary numbers have no real use at this stage, but are shown and mentioned solely to give you the big picture of how the BP Filters are switched.

Pins 42-44 of the CPU feed a neat little chip, IC-502 shown below, a basic binary-to-decimal converter, where things get a little more interesting.

IC-502: 74LS145NS

Neat chip, this one. It accepts up to a 4-bit binary input and outputs a decimal value equal to 0 thru 9. Referring to the BPF Switching Circuit diagram above, we see where output Pins 1, 10, & 11 and Input Pin 12 are not used (no need), and where output Pins 2-9 are connected to the bases of Q501-507. In the example, we see where IC-502 output Pin 2 is low and Pins 3-9 are high. This is a case where "high" signals do nothing, and "lows" do the work.

You see, Q501-507 are PNP switching transistors which cannot conduct until their bases are pulled "low". Case in point is the above example for Q501 that has a "low" on its base from IC-502, Pin 2. The bases of Q502-507 are all high. The collectors of Q502-507 are all low while the collector of Q-501 is "high". The "high" of Q501 goes to the bandpass filter for 25-40 MHz through Pin 1 of CN-1. Now "highs" do the work.

This scenario is generated by the outputs of CPU Pins 44, 43, and 42, which for the example shown above, are high, low, low, respectively. This places +5v on IC502, Pin15, and 0v on Pins 14 & 13. (Pin 12 is full time low, grounded.) This particular combination of inputs causes Output Pin 2 of IC502 to go low while all others remain "high". Q501 is therefore turned on, and the 25-40 MHz BPF is selected (turned on).

To cement your understanding of this process, I will take you through one more scenario. Suppose the scanner is zipping along at 26-ch/sec and passes ch-41 where you have programmed 868.930 MHz. As the scanner scans, its CPU oversees the operation, inserting programmed freqs into the display and tuning the scanner to receive that freq. In this case of 868.930 MHz, the CPU presents **high-high-high** at its Pins 44, 43, & 42, respectively, for three "highs" fed to IC502, Pins 15, 14, & 13, respectively. IC502 "sees" a binary "7", and drops output Pin 7 to a low state, where the low is fed to Q507's base to drive its output "high" and thereby turn on the 760-1300 MHz Bandpass Filter. At the same time, no other outputs of IC502 go low, so the other six switching transistors, Q501-506 remain turned off. Only one BPF can be turned on at a time. In conclusion, all this switching action is very fast, taking place at least 26 times per second, whether or not any RF signals are present and whether or not the scanner actually stops. This is a function controlled exclusively by the CPU, IC502, and Q501-506.

Now a word on Q501-507, specially designed switching transistors with built-in bias resistors. You will see a lot of this type of transistor used in the PRO-2004/5/6, PRO-2035, PRO-43 and other modern scanners. These transistors are designed for economy and for high speed switching. There is nothing weird about them, however.

You will notice that IC-502 is powered by +5v at Pin 16, and yet has +8v logic (7.4v) on its output pins. Fortunately, IC-502 is one of those chips that can function with different logic states between input and output, however, those +7.4v outputs do not come from IC-502. Note above where +8.2v is fed to the emitters of Q501-507 via **R501**. Note the internal construction of Q501-507 where there is a built-in emitter-base resistor and a base resistor, thereby offering an internal path from the scanner's +8v supply to the output pins of IC-502. The logic output of IC502 is LOW-based, so when its output pins are not internally driven low, the pins are free to float to whatever may be sent to them externally, in this case 8-volts, less the resistor drops. Questions? ☻

HOT STUFF, HACKERS!

I was impressed with last year's Radio Shack *Multimeter with PC-Interface*, #22-182, but when I saw the new, *#22-168* version for 1995, I just had to get one.. Both meters feature frequency counter, capacitor tester, *and* an interface for a personal computer in addition to all the regular multimeter functions! I liked last year's so well that my daughter and I each have one.

Radio Shack's new 1995 model offers several improvements over the 1994 version, including 20 MHz Frequency counter and a *dual* displays.

And WOW! Most impressive is the new *ScopeView* software that comes with this year's meter! It does graphing, data acquisition & logging, and makes using the meter much easier and a lot of fun!

I read one of the text files that came with the new meter and saw a company name and address at the head of the file. No, not Radio Shack! Rather, the authors of the new *ScopeView* program that comes with the 1995 meter. The program was such an improvement over last year's that I just had to write a note of thanks, appreciation and congratulations.
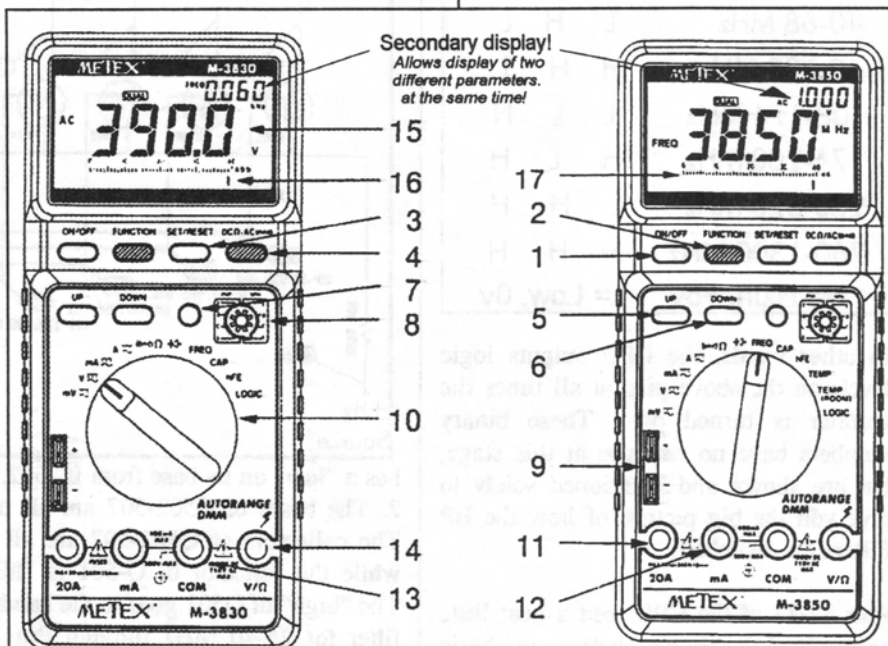
```
AGA Associates
PO Box 99573
Seattle, WA 98199-0573
FAX (206) 217-9138
```

I received an immediate response and an opportunity to get to know that company a little better. I learned that the Radio Shack *PC Interface meters* are made by a Korean manufacturer named **Metex**, already known for quality in parts of the world. Metex contracts **AGA Associates** to produce the "*ScopeView*" program for the Radio Shack meters **and** for the Metex meter line. **AGA Associates** is also a distributor for Metex. One thing led to another, until I became the proud owner of their **Metex M-3850**, a much more powerful relative of Radio Shack's 1995 PC Interface Meter.
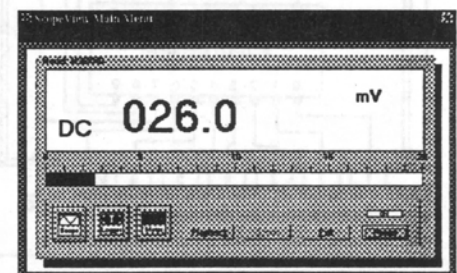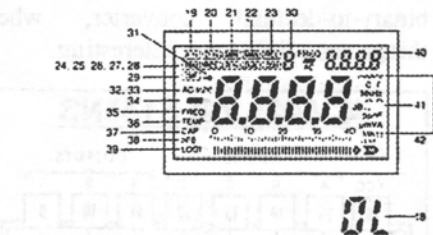
The M-3850 offers a 40-MHz frequency counter, *auto-ranging*, backlighted LCD display, 3³/₄ digit main display, two thermocouple temperature functions, the external Type K measures from -40°C to

+1200°C. The M-3850 otherwise closely resembles the Radio Shack #22-168, on which you can get the rest of the specs for this fine meter from the 1995 RS catalog, pg 118. Contact *AGA Associates*
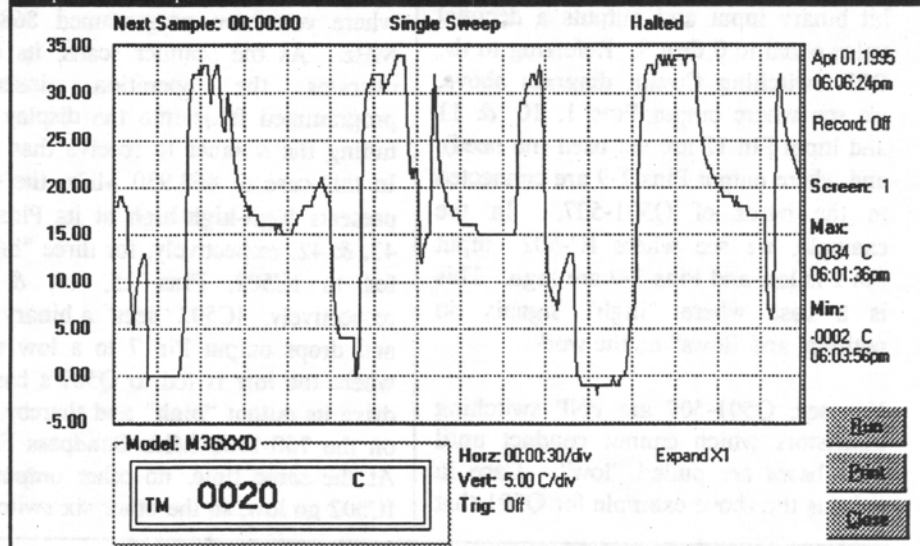
for more info on their advanced Metex meters. Radio Shack's 22-168 is $129.95. The **Metex M-3850** is a bargain at $179.95, but read on.....

1. Power Button
2. Function Button
3. Set/Reset Button
4. DC&Ω/AC & Sound
5. Up Button
6. Down Button
7. Back-Light Button
8. Transistor Socket
9. Capacitor/Temp
10. Rotary Switch
11. 20A Terminal
12. mA Terminal
13. COM Terminal
14. V/Ω Terminal
15. LCD (3-3/4 digit)
16. Analog Bargraph
17. Bargraph Scale
18. Overload Indication
19. Auto-Hold
20. Data-Hold
21. Minimum
22. Maximum
23. Relative
24. Memory
25. Memory Recall
26. Range-Hold
27. Dual Display
28. Communication
29. Comparison
30. Address No. Socket
31. Diode Test
32. AC Current/ voltage
33. Continuity Test
34. Negative polarity
35. Frequency
36. Temperature
37. Capacitance
38. Transistor hFE
39. Logic Test
40. Sub-display
41. Low Battery
42. Annunciators

Shown in the illustration on the preceding page are the functions and controls of the Metex M-3850, and a couple of views of the *ScopeView* software user interface, one of which is a *large meter readout* for the monitor and the other, a *graphical chart* of measurements made over time which can be printed or saved to a file! The example of the chart output shows the thermocouple temperature measurements I made every few seconds with ice water, ambient air and body warmth. The horizontal scale is 30-sec per division for a span of 8-mins as shown. The vertical scale goes from -5°C to +35°C in 5° increments. The parameters and scales as seen in the illustration are variable and configurable according to user requirements. You can plot and chart a wide range of voltage, resistance, current, and temperature measurements over an equally wide span of time.

Radio Shack's digital multimeter with *PC Interface*, #22-168, pg 118, 1995 Catalog, (*#22-182 was the 1994 model*) comes with AGA Associates' *ScopeView* software, just like the Metex M-3850. In fact, the three meters are mutually compatible with all versions of the software! I don't know how or if you can get the upgrade *ScopeView* program for the older meter, but a call to AGA Associates and/or Radio Shack might be productive! Best of all, these hot PC Interface multimeters can be operated as automated data loggers with a simple connection to any IBM/PC compatible computer, from an XT/AT through the ultramodern Pentium90. The *ScopeView* program that comes with the 1995 RS meter and the **Metex** meters is strictly for Windows but also included is a close equivalent for MS-DOS, so if you don't use Windows, you're not left out in the cold whatsoever.

A multimeter is a multimeter, but Radio Shack's #22-168 (*and 22-182*) and the Metex M-3850 are so much more because they can easily be connected to communicate with and be controlled by a personal computer. In fact, these meters come with the necessary cables to fit the common serial port of most IBM/PC-compatible computers ever made. Also included is the necessary software to weld computer and meter into a very powerful data acquisition system that's

capable of automatically measuring and logging voltage, resistance, current, capacitance, frequency, and even the gain of bipolar transistors! The computer writes to a simple ASCII text file whatever data at whatever measurement interval you choose, for a permanent record of "events", qualities or quantities that might be represented by the measured parameters.

For example, the Radio Shack and Metex meters can be connected to the Squelch circuit of a receiver to produce a log-style record of Squelch breaks that might later be synchronized to a simultaneous tape recording while you've been away. You could use the A/C voltage function to produce a 24-hr log of line voltage measurements to show how the power company isn't treating you right. A cadmium-sulfide cell (276-1657) connected the ohmmeter can be used to record variations of light, either sunlight through the course of day and night or as a detector for movement-triggered flood lights at night. (*I see the heart and soul of a sophisticated security system here, don't you?*) A thermistor connected to the ohmmeter can be a temperature sensor. The bench technician troubleshooting an intermittent voltage variation in a power supply or other circuit can connect these meters for unattended recordings of desired voltages while he busies himself with other productive work. If there is a periodicity to the voltage fluctuations, this could be a clue to the necessary remedial measures.

In short, the RS and Metex meters can be connected to most any kind of sensor, transducer, detector, or other signal source, to serve as a hands-off, automatic data recorder or datalogger. The applications are limited only by the imagination! Think of it this way, whatever you would do with a voltmeter, ammeter, milliammeter, ohmmeter, capacitor meter, and/or frequency counter can now be controlled by a low cost computer that might otherwise ready for the junkyard. Accumulated data is written to the ASCII text file and saved on the hard disk or floppy disk.

You might ask what can later be done with the text file of data. Process it, of course! An ASCII text file is easily

reformatted into a type of file suited for exporting into a database manager program such as dBase III, IV, Microsoft ACCESS, FoxPro, Approach, Paradox, FileExpress, PC-File, Q&A, or any of the many others. The best universal format for export to most all database managers is a *comma-delimited ASCII text file*. Database managers make quick work of data processing for human evaluation and interpretation of the results.

The aforementioned comma-delimited ASCII text file is not produced by the programs that come with Radio Shack's and Metex **PC-Interface Meters**, but their output textfiles can be manually reprocessed to make a comma delimited file with a text editor of choice (*I like QEDIT*). If you're lazy...like I am....and want it all, you are welcome to download from my *Hertzian Intercept BBS* a revised version of the 1994 meter program that will generate the comma delimited file, hands off! My dear friend and associate, Brian Greer of Los Angeles, did the necessary revisions to the open source code and made it freely available. The revised meter logger program works with either RS meter and *AGA Associates* Metex meters. This revised PC-Interface control program is named RSMETER.ZIP (about 50-kb) and is available in the **free** file section of the *Hertzian Intercept BBS*. RSMETER.ZIP also contains an icon, a PIF file and a batch file to facilitate running the data logging program from Windows™. Of course, it's a natural to run from MS-DOS as well.

Radio Shack's newest 22-168 and the Metex meters come with the previously described fantastic Windows™ *ScopeView* datalogging and scope program that beats anything I've ever seen for ten times the cost. Utterly awesome is that this program is backwards compatible with RS's older 22-182 meter, too! Now let's polish off with some real world applications for a datalogger in your shop or shack.

How about a propagation analyzer? You can get propagation charts from Monitoring Times and other shortwave literature, but are they accurate? Well, yes.....if everything meets the spec under which the charts were produced, but who can control the weather and other

variables from one locale to the next? You might want to do your own propagation studies. Easy with these PC-Interface meters. Just connect the meter to the shortwave receiver's S-meter circuit. Tune the receiver to a world class station on a frequency of interest. Turn the volume down so you're not bothered by the noise. Then set up the Interface program to log S-Meter data at periodic intervals, say once or twice a minute. Ensure things are working, and then go on about your business for the next 24 to 72 hours. When you return, you'll find a massive data file awaiting your most exacting or cursory analysis.

How about a channel traffic analysis? Sure, connect the meter to a scanner's SQuelch Gate, and set the display for a VHF-UHF frequency of interest. Run the program......and come back 24-72 hours later to find a great database that can be assessed for traffic volume and density.

If you take this business of datalogging and data processing seriously, the output file of these meters can be dropped into a spreadsheet with a $Y = mX + b$ equation to convert raw data into meaningful information. If you don't know what I mean, relax....Metex' and Radio Shack's PC-Interface Meters still offer boatloads of opportunity for personal enrichment to the greenest neophyte as well as the saltiest expert. Once you get started, you'll find yourself cruising a long hallway of progress with one door after another opening for you. The smallest things sometimes lead us to the greatest crossroads of Life. Thirty-seven years ago, I got a newfangled transistor radio for my 12th birthday. It changed my Life. *I gave my daughter one of these PC Interface meters for her 16th birthday last year.* ☺

FROM THE READERS

SCANNERS RUN 24-Hrs/DAY?

From: John Huston, Harrisonville, MO
Do you have any comments about the PRO-2006 running 24 hours per day?

ED: Well, most of my scanners see 24-hours per day operation, day in and day out, for years. The primary consideration is for how much heat builds up. If appreciable, then external DC should run the radios. We've discussed this before, remember?

Number of Subscribers in A/C 815?

From: Paul Alpiser, Loves Park, IL I'm curious as to how many subscribers you have in the Loves Park/Rockford, IL area.
ED: We show six in Area Code 815

PRO-2004 Parts Are Gone! Help!

From: Thomas Pamin, Erie PA: Regarding your article on parts for the PRO-2004, Radio Shack does not have the electroluminescent panels under either of the part #'s you mentioned. Do you have any extra ones I might be able to buy from you? I could use about six, since I have three PRO-2004's. Please let me know if you do and what the price would be. If you don't have any, do you know any other place I could get one?
ED: Try an RS Service Center? See the relevant article in this issue. I'm afraid we're out of luck, at least for the short term. I have a very small supply sufficient to meet my personal needs for the near future, but none for public consumption. I think your best bet is to lodge a protest with a supervisor at Tandy's National Parts Center (800) 442-2425, and then work your way up through the Radio Shack hierarchy into the Headshed, if necessary. There IS a certain liability on their part, I feel, despite the fact that five years have lapsed since the PRO-2004 went off sale. They should never have designed their scanners with materials known to wear out, and then not stock those parts. Then there is the matter of QA problems with the PRO-2004 early in its production cycle. Hundreds or thousands of defective or potentially defective PRO-2004's were released to the public in 1987-88. We may be dealing with a case of "planned obsolescence" here, on which you could make a solid case if you hollered loud and long enough. Radio Shack has plenty of (800) numbers to minimize costs.

BC-100XLT/BC-200XLT BATTEIES

From: Ed Vaughan, Wichita, KS: I saw your article by Greg Strauss, in V5N2 about the battery replacement for the BC-100XLT/200XLT. After 5½ years, my two battery packs on my BC-200XLT finally bit the dust. I also checked for the Sanyo replacement battery packs with no luck. Even from Uniden, the only solution was to buy the whole battery pack.

I ran across a company that sells the battery pack-inserts. They are already shrink wrapped together. All you have to do is solder the red and black wires to the new pack and put the case back together again. Whole process took about 10-mins for both packs. The rating is the same--60mA/h. Cost was $15.00 ea plus shipping (about $4.00). I used my plastic, and they arrived in five days.

They offer a higher rated pack, but I wasn't sure if the charger would handle it.

Item code: BP200/205I
Descr: Uniden/Bearcat BP 200/205 7.2V 600mA/h NiCd Battery Insert
Price: $15.00 each
E. H. Yost & Co.
7344 Tetiva Road
Sauk City, WI 53583
Voice: 608-643-3194
Fax: 608-643-4439

ED: Great info, Ed! Thanks! Good move on the higher rated packs. Rechargers must be designed for the capacity of the pack.

LAYMAN & NEOPHYTE HACKING

From: Don Alesch, Jr. Menasha, WI: Hey Bill, It's me again...hide the women & kids, grab a stuff drink and let's go...I have a suggestion for your "elementary" circuit analysis features. First, for this one I'm going to ask you to use "layman's terms". Usually, with a little research I can figure out what you're talking about. But sometimes you go way over my head. I have no formal, or for that matter practical, education in electronics. Either it works or it don't!
ED: Good point.... maybe. There is a limit as to how elementary I can get and still get the point across without taking the full 8-10 pages to nail it down. I think it would be a good idea for the future if people would question me on specifics of what is not understood so that I can either clarify my language or refer the hacker to resources.

How does one find specific areas in the service manuals and in the units that we may want to modify? Specifically, unlocking blocked frequencies. What do you look for and how do you identify such areas?

ED: Good question. In most cases, the novice can't identify those areas on his own. The purpose of a service manual for the hacker is not so he can do original research & development on his own, though if he can, more power to 'im. Rather, it is as a road map so we can play to the same sheet of music when I give out tech info.....I can do it in fewer words if we're both looking at the same diagram. In due time, the hacker will learn and master a lot of this stuff. I'll do a tech article on this subject soon, though.

As far as unmodifiable equipment, just what makes them unmodifiable?! How can one tell? I mean, why can't we just find the right area and fix this factory/government flaw. Even to the point of changing a CPU, (is that possible, why - why not?). I mean, a Scanner Wizard like yourself should have come up with a way to correct this situation by now!

You have mentioned the terms firmware and hardware. What in the world are we talking about here? And why can't we change or upgrade them?

_ED:_ More good questions. Scanner CPU's are really microcomputers, self-contained with everything they need to run alone, including volatile and non-volatile memory (RAM and ROM), an "operating system", etc. The CPU chips are manufactured with "open doors" so to speak. Manufacturers buy them; load their own unique code; then literally weld or burn the "doorway" closed so that it cannot be accessed. In general terms, this internal, inaccessible program code is called **firmware**.

You can remove and replace a CPU so long as it is pin-for-pin compatible with the original and so long as it does things within the capabilities of the hardware that's external to the CPU. If you were a programmer and knew how to set up a CPU to control a scanner, you could buy an open CPU and "burn" it with your own code, and within limits of reason, make the scanner do whatever you want it to do. This is more or less the principle of the Optoelectronics 456 Interface. It replaces the scanner's CPU to a limited extent.

You can't always tell at a glance if a scanner is "unmodifiable". That may take some experience and knowledge of the technology. The neophyte will pretty well have to go by what the experts say until he passes the green stages of hacking. In my case, I am a hardware engineer; not a software expert. About all I know of programming is that it appears on radio and TV........ But I can look at a CPU circuit and tell within minutes something of its capability. All new scanners are unmodifiable in the CPU area. Period.

On a related matter...I've seen adds for the AOR8000 megascanner. The ad states that you can get a blocked unit, or, if you're a government agent, an unblocked one. What gives?! Why can't a person get a copy of the

service manual for both versions, find the difference, order the parts, and correct the problem?
_ED:_ Maybe that is possible! More than likely, it is a matter of replacing an entire CPU/Logic board with another one; usually a fairly easy task. But to determine this requires research and development, a very expensive proposition. So far, no one has donated an AR-8000 for my research, and I am not about to buy one on a lark & gamble.

Likewise with the Bearcat 2500XLT, (Remember Uniden/Bearcat... one of your favorite Mfg's.), now they have a 3000XLT model out. they look almost identical, but advertise added bells and whistles. Again, check the differences in the service manuals, (if I knew where to look [again - in layman's terms please]), and improve on mother nature! After all we are talking about a "machine" here. Not the twisted ramblings going on in the mind of a guy named Don from Menasha!
_ED:_ True enough, but again, we're talking exhaustive research and analytical efforts. The service manual is requisite to success of such efforts, BUT..so is having the equipment in hand with which to perform tests and checks. No one has donated a BC-2500XLT or BC-3000XLT to my research. And I am not about to buy **firmware**.......

Now a short note of thanks to Greg Strauss, V5N2P6. The battery upgrade works great! Although the fine fellows at the local R.S. gave me a bewildered, almost confused look, when I tried to explain why I wanted two sets of cordless phone batteries! The hired help still believe that R-58 cable is the best for scanner applications...come on guys...haven't you ever heard of "**Dr. Rigormortis**"!?
_ED:_ It's a Cosmic Principle to take with a grain of salt whatever RS people tell you.

Well Bill, that's about it for now. Eventually you may get to a point where you'll get yourself a rubber stamp stating "RETURN TO SENDER", to use when my letters show in your mail!! So, sober up, let the wife and kids back out, and go back to that tremendous job you do so well! Hugs & Kisses,
_ED:_ Let's dispense with the H&K's. Cindy and daughter Ali keep me well stocked in that department. Sober? I used to drink like a fish, but I've been sober for five years, ever since I slithered down the stairs headfirst on a **Japanese sake**` bender while the kids were looking on, wondering why 'ol Dad was acting so weird. As for letting wife & kids out? THEY filter all my mail before I ever see it, so Life is easy for me..........

P.S. Regarding that full and complete copy of the BC2500XLT Service Manual I sent you, V5N2P7, I had that professionally reproduced at a local printer. In many ways it was better than the original! And it weren't cheap!
_ED:_ I expect not, but it still ain't **here**. ☺

HOT SCOOP ON CALLER ID

From: Michael Stams, Seattle WA: Just a quick note to fill you in on _Caller Number Identification_ (CNID) or **Caller-ID**. Enclosed is a copy of the CNID Frequently-Asked-Questions (FAQ) from the telecom archives on **ftp.ics.mit.edu**. The entire posting makes for interesting reading but section 4 is of interest. It details how the CNID data is provided.

It is important to note that CNID is not the same as _Automatic Number Identification_ (ANI) used by E911 services and 800/900 number providers. ANI cannot be blocked. The answer to the reader question "Is caller I.D. data transmitted by the base of a cordless phone?" is _No_. The cordless handset ring is

synthesized by the base unit in a fashion similar to all modern phones.

I am sorry CNID is not available in CA, but remember, one person's right is another person's invasion of privacy, the good of the many outweigh the good of the few.

ED: I have this to say about that.....when two rights are in apparent conflict, one must give way to the greater good or the higher right. Specifically, if we assume that callers and callee's have a right to privacy, then whose is the greater right? It is far easier for the caller to choose NOT to make a call than it is for the callee to choose NOT to accept a call. The caller has the instant right to his choice while the callee must weigh and deliberate first to exercise his. But the callee has no data on which to base his choice, when the phone rings.

On the other hand, the caller KNOWS whom he is calling; the callee has no clue who is calling. This is an unequal situation. Therefore, CALLER-ID performs as an equalizer without impinging on any inherent rights of the caller. If a caller wishes to be anonymous, CALLER-ID can reflect that, too, thereby giving the callee at least something in the way of equal information. CALLER-ID cannot in any way impinge on the rights of the caller.   Callers DO, however, impinge on the rights of callees. CALLER-ID could go a long way to equalizing everyone's rights......I think.

That Frequently Asked Questions file you mentioned is a good one, so I got on the Internet and ftp'd it and put it up for free access on my BBS, the Hertzian Intercept. The following file is available in the free download area of the BBS:

| CIDFAQ.TXT | 14772 | 03/16/1995 | 12:31 |

PRO-2027 CELLULAR RESTORE

I have no idea of where this came from, but cellular can be restored in the PRO-2027:

Remove bottom panel (4 screws). Locate diode D35 located behind the <Enter> key. It's a surface mount component that resembles a tiny black rectangle. Desolder and remove D35.   Gently pry up the component with a pin or tweezers while touching one leg with a soldering iron. Don't apply too much heat for very long at a time.

MARYMAC DOWN & OUT!

Tim Dowdle of Chula Vista, CA, called to tell us **Marymac Industries** of Katy, TX, is gone! The franchise store apparently was sold back to Radio Shack. Dowdle advised that *Ft. Worth Computers*, another Radio Shack franchise store, (800-433-7283), is a good alternate source for deep discounts on the better PRO-line scanners. Ask for Steve.

PRO-43 TRICKS & MODS - MISC

From: Melvin Morris, Rison, AR: You asked for ideas from readers of your books.

I use my PRO-43 for a base unit. (I am trying to sneak up on a PRO-2004/5/6), but, that may never take place. When I get 3 feet away from the PRO-43 I can't tell if it's on or off; when there is no activity. It needs a small LED on the front. Second and most important is, in the middle of a SEARCH, the scanner can stop on a carrier, or hit the control channel of a trunked system. Why can't there be a circuit to lockout these unwanted frequencies and still search that band of frequencies. You can lock them out on SCAN, but not on SEARCH.

I may be wading into deep water; but can the average person build a converter to reincarnate a scanner that just has the 400-500 MHz to 800 MHz? I know they make them, but probably hard to come by now.

I have both your books and congratulate you on them. I'm looking forward to your 3rd book when you get enough material to publish it. I'm scared that I won't know anything about it for 10 years; and by then you will be sold out. I said that for a joke but it really is the truth. Here in Arkansas we are about that far behind Calif.

ED: So long as you understand that an LED draws current and handheld scanners run from batteries that drain at the least opportune moment, then you can wire in an LED pretty much where ever you want it. First find a place for it, preferably a T-1 size or smaller, and prewire it with two color coded wires, one for the cathode and one for the anode. Install the LED and bind it with superglue or hot glue. Route the wires up to near the ON/OFF switch. Solder the cathode wire to a nearby ground. Solder a 1500Ω resistor to the switched side of the ON/OFF switch. Solder the LED anode wire to the free end of the resistor. Draws 5-ma or so.
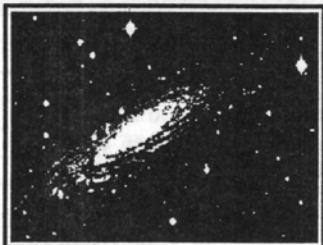
*There isn't any good way to logically sense and lockout selected freqs found in SEARCH mode of the PRO-43. It can be easily done with the **CE-232 Interface** and a PRO-2004/5/6, but not others. Technical reasons.*

Bad news on converters, but a little research in ham literature might be productive for a roll-your-own. Not easy for the beginner. Commercial models are illegal to sell now.

*See the front page for news of my 3rd book, the **Ultimate Scanner**. You're up with the times now. Arkansas ain't so bad after all! ☺*

That's it for this month, folks. Next issue should release in early May. Spring is here!

COMMtronics ENGINEERING's
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950404V5N03P10   *Spring has sprung!*

IN THIS ISSUE

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