

Don Lancaster's

# RESOURCE BIN

number seventy two

## A first look at some wireless resources.

Our usual reminder here that the *Resource Bin* is now a two-way column. You can get tech help, consultant referrals and off-the-wall networking on nearly any electronic, *tinaja* questing, personal publishing, money machine, or computer topic by calling me at (520) 428-4073 weekdays 8-5 Mountain Standard Time.

I'm now in the process of setting up my new *Guru's Lair* web site you will find at (where else?) [www.tinaja.com](http://www.tinaja.com) This is the place you'll go for instant tech answers. Among the many files in our library, you will find complete reprint sets for all of the *Resource Bin* and other columns. Plus a brand new [Research InfoPack Service](#).

You will get the best results if you have both [Netscape Communicator](#) and [Acrobat Reader 3.0](#) installed.

### Wireless Resources

The term "wireless" can mean many different things to different people. It might be anything from some antique British radio to your microwave oven. And, as interest in infrared remotes and those IRDA data links tell us, not necessarily even using "radio."

But your center of today's wireless universe seems to be what used to be called the UHF or the low microwave radio frequencies. Such as the remote controls at 300 MHz, cellular phones and personal communicators at 900 MHz, or GPS nav at 1.6 GHz.

All of a sudden, new low cost chips and new circuit developments have dramatically increased the availability of these frequencies and very much reduced your cost of using them.

Unlike conventional radio circuits, everything has to be both tiny and precise. Instead of individual R, L, or C discrete components, *distributed* or continuous circuit techniques can and must get used.

The wireless frequencies still need lots of black magic. They are not the

sort of thing you can throw together on your kitchen table. For instance, I keep getting these requests for kits and schematics for cellular phones. Neither one is likely to do you very much good at all.

Why? First because surface mount and miniature assembly techniques are a must. Second, because exotic test gear is required. Third, because the special precision filters and whatever flat out are not usually available at reasonable costs in small quantities. And finally, because much of cellular comm now involves complex digital signal processing DSP algorithms.

Let's take a look at some resources to get you started understanding and using wireless. Cellular and pagers are both big enough and important enough that we will reserve a future column for these topics. We might start off by looking into two wildly different wireless apps...

### GPS Navigation

GPS is short for *Global Positioning Satellite*, a group of 28 satellites that's intended for worldwide navigation and surveying. The Russkies also fly a similar *Glonass* satellite suite.

All the GPS satellites transmit on identical frequencies. They send out spread spectrum codes which largely center at 1575.420 MegaHertz. Their

second support frequency of 1227.60 MHz gives specialized ionospheric delay and error correction info.

By simultaneously receiving your signals from at least three (preferably four or more) satellites, you can find the latitude, longitude, elevation, and time. As well as picking up several

useful reference standards.

If you happen to be moving, use of repeated measurements can also tell you your velocity, direction, and even the acceleration.

By using one simple and low cost receiver, the best res you can quickly reach is something like eighty feet horizontally and two hundred feet vertically. You can also wait for a few hours to get more accuracy.

The next step up in improvement is to go to *differential* GPS. If you put one receiver on any fixed benchmark and record how your benchmark "moves" with time, you can pick up an *GPS error history*. This is called *differential GPS*. Differential GPS can be done by yourself or by subscribing to FM radio based or other correction services.

Corrections are usually valid over at least thirty miles or so.

Using differential correction, you might get down to about a meter in accuracy. By going to even fancier multiple GPS receivers and fancy DSP processing, you can reach real time surveyor accuracy of less than one centimeter.

The leading receiver manufacturers include *Garmin* and *Trimbal*. The best book source is *Navtech*. The *Institute of Navigation* puts on the larger shows and has useful tech reprints.

The big freebie mag is *GPS World*. Who also occasionally will publish a shopper. There is also an expensive new quarterly *GPS Solutions* journal. Two more specialized mags that I've found of unique interest are *ITS World* about *integrated transportation systems*; and *Earth Observation*.

Advertisers in the latter mag have amazingly low cost and surprisingly high resolution aerial photos available of nearly anywhere.

One good online GPS tutorial can be found at [www.utexas.edu/depts/grg/gcraft/notes/gps/gps.html](http://www.utexas.edu/depts/grg/gcraft/notes/gps/gps.html) More about GPS is found in [HACK48.PDF](#).

**NEXT MONTH: Don looks into new opportunities in surplus and auctions.**

## Pulse Monitors

Not all wireless is microwave. Let's look at an ultra low frequency and a rather slow example. One that has a Baud rate. Yup. One Baud.

That's one Baud if you are really fit. Two Baud otherwise. Or three Baud if you are in deep trouble.

A pulse monitor is some way of measuring the human heart rate. This gets important both in medicine and physical fitness. One style of pulse monitor uses infrared light and clips on an ear or fits on a finger. While cheap, these are useless for serious exercise programs. Largely because of motion artifacts.

Instead, an "EKG" type chest strap normally gets used. This chest strap picks up the microvolt sized electrical heart signals and wirelessly transmits them to your wrist display or other nearby monitor.

Here are the secret insider details: The signals are amplified and filtered and converted into individual pulses. Each pulse is then converted into a burst of 35 cycles of 5000 kiloHertz. This gets done by repeatedly impulse ringing a miniature resonant ferrite rod antenna.

Your nearby receiver uses a similar ferrite rod, an op amp, and a suitable detector. Because transmission is in the near field, the effective range is limited to three feet or so.

A leading pulse monitor supplier is Polar. Additional sources and tech details are in [HACK68.PDF](#). For more on fitness see [DONTSICK.PDF](#). Both files are found at [www.tinaja.com](http://www.tinaja.com).

## Wireless Books

The most obvious starting point for anything wireless is still right where it always was. The old *Radio Amateur's Handbook*. Possibly aided by *CQ VHF* magazine. A good basic electronics book is a must. Such as that *Art of Electronics* by Horowitz. I like to think my *CMOS Cookbook* should give you the needed background fundamentals of digital electronics as well.

There is a new Jon Hagen book titled *Radio Frequency Electronics* from Newnes that's not half bad. You also might find Joseph Carr's *Microwave & Wireless Communications Technology* a somewhat useful intro.

Technical wireless books tend to be pricey and become irrelevant or out of date in a real big hurry. You can get a complete list of these from *Amazon Books*. Amazon does run an extremely

tight ship, actually stocking only the books that really fly off the shelves. So, your best way to spot a winner is by using their "This book ships in 24 hours" status messages.

Amazon feels the big winner here is that *Spread Spectrum Communications Handbook* by Marvin Simon. Several other popular books include...

*Fixed and Mobile Telecommunications Implementing Wireless Networks*  
*Introduction to Spread Spectrum Communications*  
*Mobile & Wireless Networks*  
*Personal Communication Systems and Technologies*  
*RF and Microwave Circuit Design for Wireless Communications*  
*Wireless & Personal Communications Systems*  
*Wireless Data Handbook*  
*Wireless Data Networking*  
*Wireless Communications: Principles and Practice*  
*Wireless Infrared Communications*  
*Wireless Networked Communications: Concepts, & Implementation*

One forthcoming title that should be quite interesting is *Surface Acoustic Wave Devices for Mobile and Wireless Communications*.

By the way, I am now an *Amazon Books* associate. For your quick and convenient access to many of my own titles and the few others I specifically recommend. More details on this and all of these above mentioned titles at <http://www.tinaja.com/amlink01.html>

## Chip and Gear Sources

Surplus microwave test equipment bargains abound right here in *Nuts & Volts*. My long time favorite remains *Fair Radio Sales*, while *Radio-Research Instrument* is one source for older "big mutha" military radars.

Several outfits are newly offering rather interesting wireless products. Some now at reasonable costs. Prices are certain to drop in the future. Once again, you should find lots of these right here in *Nuts & Volts*.

For instance, *Linx Technologies* has a new low cost series of remote control transmitters and receivers.

Similar modules are now available through *Adcon Telemetry*. An exciting new concept in RFID or radio frequency identification is newly offered by the *Micron* folks through their *MicroStamp* product line.

Just about all of the semiconductor houses are big time into new wireless products. Two that I particularly like

## new from DON LANCASTER

### ACTIVE FILTER COOKBOOK

The sixteenth (!) printing of Don's bible on analog op-amp lowpass, bandpass, and highpass active filters. De-mystified instant designs. **\$28.50**

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Tech Musings V or VI	\$24.50
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Micro Cookbook I	\$19.50
PostScript Beginner Stuff	\$29.50
PostScript Show and Tell	\$29.50
Intro to PostScript Video	\$29.50
PostScript Reference II	\$34.50
PostScript Tutorial/Cookbook	\$22.50
PostScript by Example	\$32.50
Understanding PS Programming	\$29.50
PostScript: A Visual Approach	\$22.50
PostScript Program Design	\$24.50
Thinking in PostScript	\$22.50
LaserWriter Reference	\$19.50
Type 1 Font Format	\$16.50
Acrobat Reference	\$24.50
Whole works (all PostScript)	\$380.00
Technical Insider Secrets	FREE

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## SOME WIRELESS COMMUNICATIONS RESOURCES

<b>Adcon Telemetry</b> 1001 Yamato Rd Ste 305 Boca Raton FL 33431 (561) 989-5309	<b>GPS World</b> 859 Willamette St Eugene OR 97440 (503) 343-1200	<b>Maxim</b> 120 San Gabriel Dr Sunnyvale CA 94086 (800) 998-8800	<b>Newnes</b> 225 Wildwood Ave Woburn MA 01801 (781) 904-2500	<b>Samsung Semiconductor</b> 3725 N First St San Jose CA 95134 (408) 954-7000	<b>Wireless International</b> 1909 Avenue G Rosenberg TX 77471 (281) 342-9826
<b>Amazon.com Books</b> Box 80387 Seattle WA 98108 (800) 201-7575	<b>Harris Semiconductor</b> Box 883 Melbourne FL 32902 (407) 724-7000	<b>Micron</b> 2805 E Columbia Rd Boise ID 83706 (208) 386-3900	<b>Nuts &amp; Volts</b> 430 Princeland Ct Corona CA 91719 (909) 371-8497	<b>Synergetics</b> Box 809 Thatcher AZ 85552 (520) 428-4073	<b>Wireless Journal</b> 34 Loveton Circle Sparks MD 21152 (800) 472-7373
<b>Advanced Micro Devices</b> PO Box 3453 Sunnyvale CA 94088 (800) 222-9323	<b>IEEE/Micro Theory &amp; Tech</b> 445 Hoes Ln Piscataway NJ 08855 (908) 981-0060	<b>Microwave Journal</b> 685 Canton St Norwood MA 02062 (617) 769-9750	<b>OKI Semiconductor</b> 785 N Mary Ave Sunnyvale CA 94086 (800) 832-6654	<b>Texas Instruments</b> PO Box 809066 Dallas TX 75380 (800) 336-5236	<b>Wireless PCN Tcomm</b> 214 Harvard Ave Boston MA 02134 (617) 232-3111
<b>Applied Micro &amp; Wireless</b> 2245 Dillard Street Tucker GA 30084 (770) 908-2320	<b>Institute of Navigation</b> 1800 Diagonal Rd #480 Alexandria VA 22314 (703) 683-7101	<b>Microwave News</b> PO Box 1799 GCS New York NY 10163 (212) 517-2800	<b>Pen Computing</b> 88 Sunnyside Blvd #203 Plainview NY 11803 (516) 681-5208	<b>Trimble Navigation</b> 585 N Mary Ave Sunnyvale CA 94086 (800) TRI-MBLE	<b>Wireless Psnl Comm</b> 101 Philip Dr Norwell MA 02061 (781) 871-6600
<b>CQ VHF</b> 76 N Broadway Hicksville NY 11801 (516) 681-2922	<b>Intl Jnl Wireless Info Nets</b> 233 Spring Street New York NY 10013 (800) 221-9369	<b>Microwave/Optical Ltrs</b> 605 Third Ave New York NY 10158 (212) 850-6088	<b>Philips Semiconductor</b> 811 E Arques Ave Sunnyvale CA 94088 (800) 234-7381	<b>TriQuint Semiconductor</b> 3625A SW Murray Blvd Beaverton OR 97005 (503) 644-3535	<b>Wireless Product News</b> 1201 Seven Locks Rd Potomac MD 20854 (301) 340-2100
<b>Defense Electronics</b> 6300 S Syracuse Way S650 Englewood CO 80111 (303) 220-0600	<b>ITS World</b> 859 Willamette St Eugene OR 97401 (541)343-1200	<b>Microwave Product Digest</b> 20 Mercer St, 3rd Fl Hackensack NJ 07601 (201) 488-3011	<b>Polar</b> 99 Seaview Blvd Port Washington NY 11050 (516) 484-2400	<b>Video Technology News</b> 1201 Seven Locks Rd Potomac MD 20854 (301) 340-2100	<b>Wireless Satellite/Bdcst</b> 214 Harvard Ave Boston MA 02134 (617) 232-3111
<b>Earth Observation Mag</b> 13741 E Rice Pl #204 Aurora CO 80015 (303) 690-2242	<b>Jnl Microwave Power</b> 10210 Leatherleaf Ct Manassas VA 22111 (703) 257-1415	<b>Microwaves &amp; RF</b> 611 Rt #46 West Hasbrouck Heights NJ 07604 (201) 393-6060	<b>Qualcomm Inc</b> 6455 Lusk Blvd San Diego CA 92121 (619) 587-1121	<b>Wireless Cellular Tcomm</b> 214 Harvard Ave Boston MA 02134 (617) 232-3111	<b>Wireless Space Mgmt</b> 214 Harvard Ave Boston MA 02134 (617) 232-3111
<b>Fair Radio Sales</b> PO Box 1105 Lima OH 45802 (419) 227-6573	<b>Land Mobile Radio News</b> 1201 Seven Locks Rd Potomac MD 20854 (301) 340-2100	<b>Mobile Phone News</b> 1201 Seven Locks Rd Potomac MD 20854 (301) 340-2100	<b>Radio Research Insts</b> 584 N Main St Waterbury CT 06704 (203) 753-5840	<b>Wireless Data News</b> 1201 Seven Locks Rd Potomac MD 20854 (301) 340-2100	<b>Wireless System Des</b> 611 Rt #46 West Hasbrouck NJ 07604 (201) 393-6060
<b>Fujitsu</b> 3545 N First St San Jose CA 95134 (800) 642-7616	<b>LanWave</b> 20111 Stevens Creek #260 Cupertino CA 95014 (408) 253-3883	<b>Motorola Semiconductor</b> 6501 Wm Cannon Dr W Austin TX 78735 (512) 891-2000	<b>RF Design</b> 5660 Greenwood Plaza #350 Englewood CO 80111 (303) 793-0448	<b>Wireless Design &amp; Dev</b> 301 Gibraltar Dr Morris Plains NJ 07950 (201) 292-5100	<b>Wireless Tcomm Invstr</b> 126 Clock Tower Pl Carmel CA 93923 (408) 642-1536
<b>Garmin</b> 9875 Widmer Rd Oenexa KS 66215 (800) 800-1020	<b>Linx Technology</b> 1089 Medford Center #137 Medford OR 97504 (541) 471-6256	<b>MX-Com Inc</b> 4800 Bethania Station Rd Winston-Salem NC 27105 (800) 638-5577	<b>RF Microdevices</b> 7625 Thordike Rd Greensboro NC 27409 (910) 664-1233	<b>Wireless Design &amp; Tech</b> 301 Gibraltar Dr Morris Plains NJ 07950 (201) 292-5100	<b>Wireless Telecomm</b> 214 Harvard Ave Boston MA 02134 (617) 232-3111
<b>GPS Solutions</b> 605 Third Ave New York NY 10158 (212) 850-6088	<b>Loud &amp; Clear</b> PO Box 646 Stoughton MA 02072 (800) 366-2266	<b>Navtech Books &amp; Software</b> 2775 S Quincy St #610 Arlington VA 22206 (800) NAV-0885	<b>Rohm Corporation</b> 2150 Commerce Drive San Jose CA 95131 (888) 775-ROHM	<b>Wireless Integration</b> 10 Tara Blvd 5th Fl Nashua NH 03062 (603) 891-0123	<b>Wireless Week</b> 600 S Cherry St #400 Denver CO 80222 (303) 393-7449

are *MX-COM* with all of their unique communications chips and the *Maxim* folks who do offer a brand new line of direct digital wireless receiver front ends. Their Max2420 is typical.

Other wireless players include...

*AMD*  
*Fujitsu*  
*Harris Semiconductor*  
*LanWave Components*  
*Motorola*  
*OKI*  
*Qualcomm*  
*Philips*  
*RF Micro Devices*  
*Rohm*  
*Samsung*  
*Texas Instruments*  
*TriQuint*

But nearly everyone is in the game. Or else shortly will be.

### Older RF magazines

Several useful trade journals have been around for years. Covering this "wireless" stuff long before the term ever became newly popular.

The *RF Design* trade journal has a readable mix of high frequency, VHF UHF, and microwave techniques in it. The *Microwave Journal* is an older and rather snotty free trade journal about traditional microwave applications. *Defense Electronics* has a tighter focus. *Microwaves & RF* is a friendlier and more readable alternative.

Turning to those oversize tabloid shoppers, the leader here does seem to be *Microwave Product Digest*

On the more expensive and more scholarly level, you'll find the *IEEE Transactions on Microwave Theory & Techniques*, their *Microwave and Guided*

*Wave Letters*, and their *Transactions on Medical Imaging* to be useful.

Other sources publish a *Microwave and Optical Technology Letters* and the *Journal of Microwave Power*.

### New Wireless Magazines

There's also a bunch of new kids on the block, addressing all the specific needs of emerging wireless apps. The newest and latest free trade journal appears to be *Wireless Integration*.

Other currently popular wireless trade journals include...

*Applied Microwave & Wireless*  
*Wireless Design & Technology*  
*Wireless Systems Design*  
*Wireless International*  
*Wireless Week*

Useful shoppers are *Wireless Design & Development*; *Wireless Product News*;

*Loud & Clear*; and *Wireless Journal*.

For emerging portable computing wireless apps, the winning magazines appear to be *Pen Computing*, *Mobile Office*, *Mobile Electronics Retailer*, and the *Video Technology News*.

Two of the new journals include the superb *International Journal of Wireless Information Networks* or that *Wireless Personal Communicatons*.

### A Look Online

Searching on *Hotbot* gives you over a quarter million hits on "wireless".

Even "wireless standard" gets you 60,000 hits. So, you'll have to narrow your quest with additional keywords of specific interest. Obviously, there is tons of stuff online.

For a random sample, try [www.apspg.com/wc/introduction.html](http://www.apspg.com/wc/introduction.html)

Here are a few of the more obvious newsgroups...

[alt.cellular](mailto:alt.cellular)  
[alt.cellular.motorola](mailto:alt.cellular.motorola)  
[alt.cellular.oki](mailto:alt.cellular.oki)  
[alt.cellular-phone-tech](mailto:alt.cellular-phone-tech)  
[comp.std.wireless](mailto:comp.std.wireless)  
[sci.geo.satellite-nav](mailto:sci.geo.satellite-nav)  
[sci.electronics.repair](mailto:sci.electronics.repair)  
[sci.electronics.design](mailto:sci.electronics.design)  
[sci.electronics.misc](mailto:sci.electronics.misc)

Many thousands of additional hot linked newsgroups can be found at [www.tinaja.com/text/newslst.html](http://www.tinaja.com/text/newslst.html). I've also got a new combination on and off line search service available for you at

[www.tinaja.com/info01.html](http://www.tinaja.com/info01.html)

If you are at all serious in learning wireless design, one of the first things you'll want to grok is the *Smith Chart*. These charts are the "Ohm's Law" of the microwave nether regions. I have uploaded some online Smith Chart generation software as [SMITHCHT.PS](http://SMITHCHT.PS)

Print these on demand.

### Pricey Newsletters

As with most any fast advancing technical field, there's lots of printed wireless newsletters. They usually do cost several hundred dollars per year, so they are mostly of interest to well funded insiders who need accurate information right now. Their value, of course, varies all over the lot.

Some examples include...

*Land Mobile Radio News*  
*Microwave News*  
*Mobile Phone News*  
*Wireless Cellular Telecomm*  
*Wireless Data News*  
*Wireless Messaging Report*  
*Wireless PCN Tellecomm*  
*Wireless Satellite & Broadcasting*  
*Wireless Spectrum Management*  
*Wireless Telecom Investor*  
*Wireless Telecommunications*

Please let me know if you have any comments on all these, favorable or otherwise. A reminder that a custom wireless research is available to you per [www.tinaja.com/info01.html](http://www.tinaja.com/info01.html)

Be sure to check this one out.

### This Month's Contests

For our contest this month, just tell me about any wireless resource that I don't already know about. Especially if you are personally familiar with a good wireless book title, let me know which one it is, what it does for you, and why you like it.

There should be a largish pile of my new *Incredible Secret Money Machine II* books going to the dozen or so better entries, plus an all-expense-paid (FOB Thatcher, AZ) [tinaja\\_quest](mailto:tinaja_quest) for two that will go to the very best of all.

Send all your *written* entries to me here at [Synergetics](http://Synergetics), rather than to *Nuts & Volts* editorial.

Let's hear from you. ♦

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*Microcomputer pioneer and guru Don Lancaster is the author of 33 books and countless tech articles. Don maintains his no-charge US tech helpline found at (520) 428-4073, besides offering all of his own books, reprints, and consulting services. Don also offers a free catalog full of his unique products and resource secrets. The best calling times are 8-5 on weekdays, Mountain Standard Time.*

*Don is in the process of setting up his Guru's Lair at <http://www.tinaja.com>*

*Full reprints and preprints of all Don's columns and ongoing tech support appear here. You can reach Don at Synergetics, Box 809, Thatcher, AZ 85552. Or send any messages to his US Internet address of [don@tinaja.com](mailto:don@tinaja.com)*