Don Lancaster's

RESOURCE BIN

number forty seven

A look at telecommunications 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.

US callers only, please.

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* This is the place you 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 Synergetics Consultant's Newtwork & lots of links to unique web sites.

You will get the best results if you have both *Netscape Gold* and *Acrobat Reader 3.0* installed. This new reader does utterly amazing things online.

Telephone Electronics

This month, I thought we'd take a look at some lesser known resources involving telephone comm.

Happily, the statute of limitations is long expired on the phone phreaking secrets I am about to reveal here. In print for the first time ever.

Back before they had phone freaks, they had me. In those times, things sure were a lot simpler. To get a free local phone call, you simply shoved a pin through the handset cable on a pay phone. You then grounded it to the coin slot. Briefly

A free long distance call was a tad trickier. The worst part was that you had to borrow enough change to start your actual call. One minute into your conversation, you inserted a special "W" shaped coat hanger into the coin return and flipped the mechanism.

Free phone calls were essential to a starving college student in the early sixties. Especially since they kept all the females locked up 40 miles away at Cedar Chest College.

Winos would also stuff paper on up the coin returns of pay phones at bus stations and such. People in a hurry usually would not complain. A route of several dozen phones sometimes yielded a marginal income.

The more astute of you might note that pay phones these days seem to include an armored cable and a coin return hopper or reverse flipper.

Ever wonder why?

Some Basics

Your phone line consists of a +48 volt dc source having an impedance of roughly 600 Ohms. The green wire is normally positive and called the *tip*. The red wire is normally negative and called the *ring*. The names date from when real phone jacks got used.

In its *on hook* state, *only* the bell of your telephone gets connected to your line through a dc blocking capacitor. The capacitor value and inductance of a traditional bell winding resonate at a 40 Hertz low audio frequency.

To ring the phone, a very high ac voltage of 100 volts or so is applied at a frequency of 40 Hertz. At one time long ago, different ring frequencies were used to selectively isolate party line phones. In more modern phones, a series resonant circuit extracts the ring information.

NEXT MONTH: Don looks at recent developments in solar power and alternate energy.

Picking the phone up *off hook* loads the line, dropping its dc voltage to eight volts. One way you can tell if a modem or extension phone is active is to simply measure the dc line voltage.

Details in HACK41.PDF

Dialing is done in one of two ways. That *pulse* method used a mechanical dial. It *broke* the line connection equal to the number of counts desired. For a zero, you got *ten* counts.

The *Touch Tone* scheme generates a pair of audio tones using a *two-of-eight* code selected from four *low band* tones and four *high band* tones.

The rest of your phone is mostly a microphone or other voice *transmitter* and a headphone or some other voice *receiver*. These two interact through a nearly balanced *hybrid* transformer.

The main purpose of the hybrid is to allow full duplex conversations. By letting your transmitted audio go out over the phone line and the incoming audio go to the receiver.

A slight unbalance is created in the hybrid to let a little of the transmitted energy appear in the receiver. This is called the *sidetone* and lets you hear yourself. It is just enough to keep you from shouting.

The normal telephone signal levels are somewhere below 0 DBM. Or one milliwatt into 600 Ohms. Equal to an ac voltage under one volt rms.

The only real differences between voice, fax, and modem is that fax and modem send out specific tones used for digital data comm. Unless special steps are taken (involving digitized audio), you can *not* simultaneously send voice and high speed data over the same phone channel.

Current Topics

Some of the phone stuff that seems to interest a lot of people these days: Part 68 interfaces, line recording, ring detection, call progress monitoring, touchtone encoding and/or decoding, PostScript fax, and caller id.

Two sets of highly restrictive FCC rules apply when you connect to the phone line. Part 15, which is plain old "thou shalt not transmit interference". And Part 68, covering the specifics of phone line interconnect.

More Part 68 interface details are in HACK07.PDF and HACK61.PDF.

In general, all you'll really need to meet FCC Part 68 is a transformer and some clipping diodes to restrict max amplitude. But extensive certification testing is involved. Gruesomely so. In particular, the lateral balance spec is a real bear to meet.

Carefully selected capacitors could replace a fancy transformer. But it is extremely tricky to do so.

The FCC regs appear in several blue and white volumes that are part of chapter 47 of the CFR. Or otherwise called the *Code of Federal Regulations*. These are found in any large library that has a government docs section. You can also buy them directly from the *US Government Bookstore*.

Your cost is around $17 per volume. There are five or six volumes needed for the full set of FCC specs.

Because meeting the Part 68 specs are so gruesome, most users will opt for a "pass through" certification.

Where you buy a certified interface and then call it your own. Several *Nuts&Volts* advertisers offer low cost kits here. *Circuitwerkes* is one hobby source. Two commercial sources here include *Cermetek* and *Dallas*.

More on getting your own Part 68 certification appears in the *Compliance Engineering* trade journal. More on FCC specs in HACK45.PDF.

A telephone recorder is basically a simplified Part 68 interface. A typical circuit appeared in HACK07.PDF. And also available in the *Hardware Hacker* reprints. Ring detection is often done by use of a zener-LED-photodetector lashup. Custom ring detector ic's also exist. With *Texas Instruments* being a leading supplier. More details once again in HACK07.PDF.

Call progress detectors get involved if a modem has to determine whether a busy signal arrived or if a call has gone through. *Teltone* is the leading supplier for these low cost chips. A circuit appears in HACK17.PDF.

The touch tones are a two-of-eight selection of a group of low and high audio tones. These could be useful for telephone signalling, for ham repeater control, and some alarm and coding applications.

But their baud rate is horribly low for anything else. These chips come from *Teltone* and similar sources. The *Basic Stamp* from *Parallax* has a totally hassle-free touch tone generator built in to its unique firmware.

PostScript FAX is a new system that completely, totally, and utterly blows away grubby old FAX. This gives you precise *camera-ready* art much faster and cheaper. Even when sent to an ordinary FAX machine, the quality is ridiculously higher. More on this new technology is found in ATN5011.PDF, ATN5128.PDF, ATN5135.PDF, and in FAXPRINT.TXT.

Ah yes, caller id. By far number one in file popularity on PSRT. Start with HACK40.PDF for a tutorial. Next, you search under "caller" for the dozens of additional files and circuits.

Basically, a short data burst is sent between your first and second rings. Even though it is transmitted at 1200 baud, this burst is *not* receivable by an ordinary modem. Because of the odd format and framing used.

Bellcore

The horse's whatever source for all telephone standards is *Bellcore*. Very pricey, but they do have a free catalog on all their specs and guidelines.

Nearly all of the technical details of the phone system are covered.

Other sources for some telephone specs include *The Information Store* and *Global Engineering Documents*.

Telecom Books

The best phone book store I have found so far appears to be *Telecom Books*. They have several free catalogs available. Including one centered on computer telephony. Many hundreds of new titles are available.

Probably the best starter book is *Understanding Telephone Electronics* by Stephen Bigelow. Another one is *Basic Telephone Installation*. This one is in the *TeleTraining Pocket Guides*.

One good third party caller id book is the *Principles of Party Line Station Identification*. Telecom also resells a *Computer Telephony Starter Kit*.

This five book collection includes *Newton's Telecom Dictionary*, *Computer Based Fax Processing*, *PC Telephony*, *Client Server Computer Telephony*, and *Telephony for Computer Professionals*.

By the way, I finally did find out what "client-server" means. The term means the same as "lemon-scented".

Hello Direct

These folks are the highest profile direct mail phone store. Scads of new products but zero discounts. Mostly office phone accessories.

At (800) HI-HELLO, they have to be one of the easiest remembered phone numbers of all time. Free catalogs.

TELECOMMUNICATIONS RESOURCES

Asian Sources/Wordright
1020 Church St
Evanston IL 60201
(708) 475-1900

AT&T Microelectronics
555 Union Blvd
Allentown PA 18103
(800) 372-2447

Bell System Tech Jnl
101 JF Kennedy Pkwy
Short Hills NJ 07078
(201) 564-4454

Bellcore
445 South St 2J-124
Morristown NJ 07926
(201) 829-4785

Cellular Business
9800 Metcalf
Overland Park KS 66212
(913) 341-1300

Cellular Marketing
6300 S Syracuse Way Ste 650
Englewood CO 80111
(303) 220-0600

Cermetek
1308 Borregas Ave
Sunnyvale CA 94088
(408) 752-5000

Circuitwerkes
6212 Southwest 8th Place
Gainesville FL 32607
(904) 331-5999

Communications
6300 S Syracuse Wy #650
Englewood CO 80111
(303) 220-0600

Communications News
2504 N Tamiami Tr
Nokomis FL 34275
(813) 966-9521

Communications Technology
PO Box 3208
Englewood CO 80155
(303) 792-0023

CommunicationsWeek
600 Community Dr
Manhasset NY 11030
(516) 562-5000

Compliance Engineering
629 Massachusetts Ave
Boxborough MA 01719
(508) 264-4208

Computer Telephony
12 W 21 St
New York NY 10010
(212) 691-8215

Dallas Semiconductor
4401 Beltwood Pkwy S
Dallas TX 75244
(214) 450-0400

Data Communications
1221 Americas Ave
New York NY 10020
(212) 512-2000

Information Store
500 Sansom St #400
San Francisco CA 94111
(415) 433-5500

Exar Corp
PO Box 49007
San Jose CA 95161
(408) 732-7970

FiberOptic Product News
301 Gibraltar Dr
Morris Plains NJ 07950
(201) 292-5100

GEnie
401 N Washington St
Rockville MD 20850
(800) 638-9636

Global Communications
6300 S Syracuse Way #650
Englewood CO 80111
(303) 220-0600

Global Eng Documents
15 Inverness Way East
Englewood CO 80112
(800) 854-7179

Hello Direct
140 Great Oaks Blvd
San Jose CA 95119
(800) HI-HELLO

Horsetrader
PO Box 11712
Santa Ana CA 92711
(712) 921-3120

Land Line
PO Box L
Grain Valley MO 64029
(816) 229-5791

Lightwave
10 Tara Blvd 5th Fl
Nashua NH 03062
(603) 891-0123

The Mart
899 Presidential Ste 110
Richardson TX 75081
(800) 864-1155

Mitel
2321 Morena Blvd #M
San Diego CA 92110
(619) 276-3421

Mobile Radio Technology
9800 Metcalf
Overland Park KS 66212
(913) 341-1300

Motorola
5005 E McDowell Rd
Phoenix AZ 85008
(800) 521-6274

MX-Com Inc
4800 Bethania Station Rd
Winston-Salem NC 27105
(800) 638-5577

Network Computing
600 community Dr
Manhasset NY 11030
(516) 562-5000

Nuts & Volts
430 Princeland Ct
Corona CA 91719
(909) 371-8497

Parallax
3805 Atherton Rd #102
Rocklin CA 95765
(916) 624-8333

Printer's Hot Line
PO Box 1709
Fort Dodge IA 50501
(800) 950-7746

RCR Wireless Comms
1728 Downing St
Denver CO 80218
(303) 832-6000

SGS-Thomson
1000 E Bell Rd
Phoenix AZ 85022
(602) 867-6259

Sierra Semiconductor
2075 N Capitol Ave
San Jose CA 95132
(408) 263-9300

Surplus Traders
PO Box 276
Alburg VT 05440
(514) 739-9328

Synergetics
Box 809
Thatcher AZ 85552
(520) 428-4073

Telecom Library
12 West 21st St
New York NY 10010
(800) LIBRARY

Telecommunications
610 Washington St
Dedham MA 02026
(617) 326-8222

TeleProfessional
209 W 5th Street #N
Waterloo IA 50701
(800) 338-8307

Teltone
22121 20th Ave SE
Bothell WA 98021
(800) 426-3926

Texas Instruments
PO Box 809066
Dallas TX 75380
(800) 336-5236

Ulrichs Dictionary
121 Chanlon Rd
New Providence NJ 07974
(908) 771-7714

US Government Bookstore
720 N Main St
Pueblo CO 81003
(719) 544-3142

Wireless Design & Dev
301 Gibraltar Dr
Morris Plains NJ 07950
(201) 292-5100

The Mart

This one is by far the best magazine for most telephone bargains. Over 200 pages per month. It's pretty much an "ads-only" tabloid classified shopper. But does have tech tutorials.

Their ads list everything from pay phones to recycled PBX units on up to headsets and handsets. Repairs and site services, too.

Be sure to check out those sister publications of *The Mart* as well. Their *Comp-U-Mart* utterly blows *Computer Shopper* away. And their *Printer's Mart* is right up there with *HorseTrader* and *Printer's Hot Line* for printshop and desktop publishing bargains.

Surplus Traders

A great source for just about any surplus telecomm is Marvin Birnbom at *Surplus Traders*. He maintains hot daily buy-sell FAX sheets.

Telecom Sources

The real phone bargains come from the Far East. *Telecom Sources* is one of a group of fat and slick trade journals distributed by *Asian Sources*. A recent issue focused upon cordless phones, home fax machines, telecom chipsets, private paging systems, and modems. A good mix of tech info is combined with hundreds of ads.

Telecom Sources is intended mainly for the large quantity buyer. But the technical information is useful for just about anybody.

Subscriptions are a tad pricey at $65 per year. But if you can find *any* copy of *any* magazine in the series, there is a mail-in coupon to get a sample of any other mag offered.

The other magazines in the series include *Electronics*, *Timepieces*, *Gifts & Home Products*, *Electronic Components*, *Computer Products*, *Fashion Accessories*, and *Hardwares*. By "Hardwares" they mean things like drill presses.

These magazines are probably *the* best way to find far eastern contacts.

A free finder service is offered.

Other Trade Journals

As with any field, there are zillions of trade journals. All you have to do is pin them down. Most are free. And, for most of the remainder, you can get a freebie copy just by requesting an advertising media kit. While I may have mentioned this a time or three before, *Ulrichs Periodicals Dictionary* is *the* place to go to get a list of all mags everywhere. Either on the reference shelf of your local library, or online through *GEnie*.

By far the most important historical pub, of course, is the old *Bell System Technical Journal*. The bible of phone phreaks everywhere. Those innermost secrets of the phone company all laid bare. This one has apparently ceased publication. But it remains available in larger technical libraries.

I have posted a listing of comm resources as HACK64.PDF.

A few random samples...

Computer Telephony calls itself "The magazine for computer and telephone integration." Sister magazines include *Teleconnect* and *Call Center*. The latter is a support mag for customer service help desks and such.

Lots of publications seem to have "communications" in the title. Some of the more interesting include...

All in Communications
Communications
Communications News
Communications Technology
Communications Week
Data Communications
Global Communications
Telecommunications

Network Computing also has some useful phone stuff in it.

Cellular Business is about marketing and distribution of the cellular phones and services. One of their competitors is *Cellular Marketing*. Pagers and such appear in *Mobile Radio Technology*. An insider trucker mag is *Land Line*.

Fiber optic comm is well covered in both *Fiber Optic System Design* and in *LightWave*. One of the best of the new wireless mags is *Wireless Design and Development*. A second source is *RCR Wireless Communication*.

Last and least, that *TeleProfessional* teaches you how to make obnoxious and annoying phone calls.

When the Chips are Down

The two most interesting telecomm chip houses are *Teltone* and *MX-COM*. Teltone is big on their call progress detectors. Plus touchtone encoders and decoders. MX-COM has all sorts of neat stuff. Including scrambling and privacy circuits. Bunches of mobile comm selective calling. And a brand new caller id chip.

Your best older source for caller id chips is *Sierra Semiconductor*. With *Exar* and *Motorola* being the also rans. *Mitel* has a lot in the way of PBX and crossbar semiconductors.

Uh, for some strange reason *AT&T* seems to want to sell telephone chips. As does *Signetics* and *SGS*. One source for ring detectors is *Texas Instruments*.

Power supply chips that rob phone line power are sold by *Maxim*. They do offer free samples.

A Network Interface

I just picked up a great heaping bunch of *Northern Telecomm* type 2960 network interface devices. These are an epoxy module which goes between you and your phone line. If there is any problem, their 2960 will *remotely* disconnect you. Running some simple telco tests then finds out whether the problem is your fault or theirs.

All easily handled from their front office. Without a field service call!

Note that the phone line polarity is sometimes *reversed* when they are using maintenence diagnostics.

For this reason, all direct network interface *must* include a full wave dc bridge to keep the right polarity. Of course, the phone company only fixes their own problems. Never yours.

Much more on this useful beastie in MUSE96.PDF. You can easily modify these dual bilateral analog switches into all sorts of non-phone aps. From pulse generators to LED flashers to antique radio test generators.

You basically have an isolated pair of bilateral analog switches. These snap on when their terminal voltage exceeds 17 volts.

They snap back off whenever the current through them reverses or else drops under three mils. There's also several tantalum caps and zeners and such in the module.

Let me know if you want some of these to play with. Yeah, I've also got full specs available.

This Month's Contest

Let's have three different contests this month. Tell me about some telco resource I don't know about. Or find a new ap for the 2960.

Or find me a buyer for the three cubic yards of *Northern Telecomm* 2960 network interfaces currently piled up in my driveway. These are clean and unused 1988 production. Sadly, there are not quite enough of them to glue together to make a carport.

Pretty close, though.

There will 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* for two that will go to the very best of all

By the way, I have just posted the insider secrets to winning just about any trade contest to CONTEST.PDF.

Even more by the way, I have just bought an *entire* community college electronics department at auction. So I've got some really great one-time buys. Especially Tektronix. You can write, call, or email for a current list.

Let's hear from you. ✦

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 has two free catalogs full of his resource secrets waiting for you. Your best calling times are 8-5 on weekdays, Mountain Standard Time.

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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

