

Don Lancaster's

Tech Musings

November, 1995

Important EE Internet sites
Pseudoscience strikes again
A MIDI electronic music book
BASIC Stamp II microcomputer
Microcomputer startup resources

It's now our monsoon season out here in Arizona. For some wierd reason, this seems to bring the perpetual motion folks and all those pseudoscience enthusiasts out of the woodwork. I've recently been seeing one a day. Org.

One was a "motors and magnets" drop in. Uh, sure, a magnet offers a repulsive force. But only a few PM "developers" seem to pick up on the fact that you have to think *cyclically*. The energy you will need to get your magnets into a position where they can do the repulsion *always* exceeds any possible output. Every time.

The second was an individual who genuinely and truly believes he has a workable *zero point energy* solution. For some strange reason, he is sorely lacking development funds. He does appear a lot more credible than most. To be fair, I'll have to put this one in my "wait and see" mode. But I won't be holding my breath.

Meanwhile, all of the cold fusion diehards appear to have gone into a "circle the wagons" state. They also seem to be running critically low on ammunition. They are now centered on an *Infinite Energy* magazine and an *CFNET* online resource. The fact that they have now allied themselves with pyramid power (now renamed as *tetrahedral superscalars*) does not bode well. Grimm, even.

Genuine new energy developments certainly will emerge. And research certainly should continue. So should independent thinking.

For instance, the August 18th issue of *Science* tells us about a dramatic improvement in lower cost polymer solar cells. On pages 920-921. These still remain woefully inefficient and totally unstable. But they just got a whole bunch better.

It seems to me that any legitimate new energy development has to meet several guidelines: This will have to (A) unquestionably and economically generate *one net watt* of useful power in (B) a simple experiment. Easily (C) verified by disinterested outsiders. Created by a credible individual who

is (D) *both* trade journal and on-line research literate. Plus is (E) *totally* devoid of paranoid, patent, political, or puritanical hangups. And backed up by (F) some reasonable *and likely* theoretical framework soundly based upon classic physics.

The latest PM flap on the Internet involved the usual screwup: *You can not measure any ac power by using a voltmeter and an ammeter!*

Never could and never will. More on this in my [HACK49.PDF](#) or in my *Hardware Hacker* reprints.

As usual, their "over unity energy gain" was in fact nothing but awful labwork. Labwork so mesmerizingly bad that it was *not even wrong*.

The *Skeptical Enquirer* is a good source for pseudoscience debunking. All of the latest new pseudoscience

developments often show up in the *KeelyNet BBS*. Much more on all this in [RESBN24.PDF](#) on www.tinaja.com And in my *Resource Bin* reprints.

The sad thing about wasting your time on *any* pseudoscience is that the odds of any success are *zero*. Instead, there are so many new and exciting things you could be trying instead.

Such as my new magic sinewaves, that mystery band, those PIC chips, X-Y flutterwumpers, isopods, DNA computing, spread spectrum comm, Book-on-demand publishing, desktop finishing, and fluxgates.

Or car alternator steppers, Santa Claus machines, short haul telemetry, sonoluminescence, or Navicubes.

Details are found in the *Incredible Secret Money Machine II*. Also see [EMERGOP4.PDF](#).

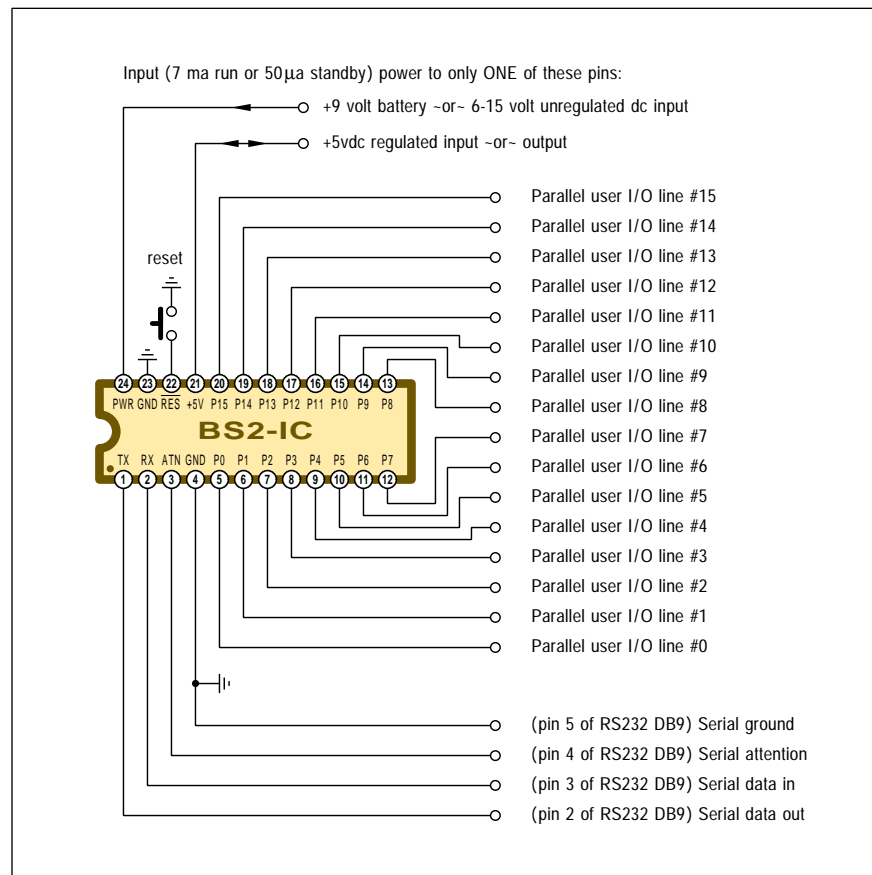


Fig. 1 – THE BASIC STAMP II has greatly improved capabilities over its earlier release. This is a \$49 computer the size of a 24 pin DIP.

MORE OUTPUTS–

There are now sixteen user defined parallel I/O lines. Each can source or sink 20 mAs over the full supply range.

MORE MEMORY–

There is now a 2K nonvolatile program memory, good for several hundred BASIC statements, plus lots of data storage.

IMPROVED MEMORY ACCESS–

Data may now be prewritten into memory before downloading your Basic program. You can also read or write nonvolatile memory data.

FULL TIME SERIAL–

The serial port is now usable at runtime, following simple software commands. The baud rate can go as high as 38,400.

TOUCH TONE OUTPUT–

Simultaneously generates a touch tone audio tone pair. Can also be used to generate one or two sinewaves of any frequency to 32 kHz.

BSR OUTPUT–

Directly generates the BSR home remote control tones. For use with a TW513 or TW523 power line interface module.

PWM OUTPUT–

Simple commands output any number of variable duty cycle pulses. Making for ultra-simple D/A conversion.

POTENTIOMETER INPUT–

Directly measure an analog potentiometer. Can also be used to measure RC charging or discharge times.

BIT SHIFTING–

Shift bits in from parallel to serial. Or shift bits out serial to parallel. Valuable for talking with other microcontrollers.

CYCLE COUNTER–

Count the cycles on any pin for a given time period. Input frequency can be as high as 150 kHz.

POWER MATH–

New single command math features now include square root, sine, cosine, and absolute value. One degree accuracy on trig.

POWER LOGIC–

Unusual new bit and digit manipulation features include a priority encoder, decimal digit selector, order reversal, and lots more.

You can power your stamp from a nine volt battery or an unregulated 6-15 volt source. Sent to its built-in voltage regulator. Or, you can instead directly input a five volt regulated dc system supply voltage. The operating current is typically seven mAs. Some standby options can reduce this down into the 50 microampere range.

There is an optional breadboard area. It is about three inches square. Included are battery clips, the reset button, and an DB-9 connector for RS-232 serial access.

Improved features include more memory, better and faster serial, BSR and touchtone outputs, and lots more output lines. Your programs can now be as long as 600 BASIC instructions. There is also a modest performance speedup. This is by far the easiest to use microcontroller ever.

I particularly like their easily done A/D conversion that makes use of RC discharges. And the D/A conversions based on PWM pulse widths.

You can download all the Basic Stamp manuals and application notes from parallaxinc.com

Some Alternatives

The BASIC stamp is obviously *the* best starting point when you decide to become microcomputer literate. And its PIC chip is *by far* the best low cost microcontroller available today. First because of its 3X speed and 3X program length advantages. Second, because it is cheap, simple, and genuinely fun to use. And third, because the PIC strongly encourages highly creative new algorithms.

As we've seen in the past, the PIC now makes it *totally unthinkable* to ever again use the 555 timer. Or any other "bits and pieces" solution.

But there are some useful BASIC Stamp alternatives. I've listed several of them in our resource sidebar.

Any interpreted language will chew up resources and slow you down. By definition. So, once you're past your bare beginnings of understanding a microcontroller, your stamp may end up a little slow and a tad cramped.

As always, your solution is to drop on down into machine language. In which you select only the exact code you need. Trading off speed against storage for an optimum. And literally creating your own custom integrated

Fig. 2 – NEW OR IMPROVED FEATURES of the Basic Stamp II.

The BASIC Stamp II

Lance Wally of *Parallax* just sent me a few samples of his new *BASIC Stamp II*. This is his \$49 PIC based microcontroller the size and shape of a 24 pin DIP integrated circuit. The pinouts are shown in figure one, and new features in figure two.

You program the Basic Stamp by connecting it to a PC's serial port and

then executing host software. Which places tokenized BASIC commands in the Stamp's internal non-volatile memory. Once programmed, your stamp may be taken anywhere or get used any way you care to.

Because of the nonvolatile flash serial EEPROM memory used, you can reprogram your Basic Stamp as often as you like. Making for simple debugging and reuse.

circuit in the process.

You can begin with the *PIC Data Handbook* and that *Microcontroller Applications Handbook* offered by *Microchip Technology*. I've posted a PIC intro as [MUSE88.PDF](#).

Scott Edwards offers lots of useful PIC products. His *PIC Software Tools* has machine language equivalents to most of the Stamp commands. You select only the ones you really need. These run a lot faster and take up far less memory. Scott also offers stamp extenders and interfaces for servos, LCD displays, thermometers, touch tone decoders, and A/D converters.

Meanwhile, *Steve Ciarcia* over at *Micro Mint* has an *Intel* approach to low end micros in his new low cost *Domino* series. These are well done "sort of Stampish" solutions. If you like Intel chips (I most definitely and emphatically do not), these might be a good route to explore.

Whenever the Basic Stamp is not "enough", you might instead want to consider the 65C265 based *Mensch* computer offered by *Western Design Center*. We looked at this gem last month. And in [MUSE93.PDF](#). This one includes PCMCIA card access, a graphics and text video display, a printer add-on, 12 meg addressability, and full expandability.

Meanwhile, *Motorola* is offering a bargain \$95 development kit on their older 6805 micro. The part number is 68HC705J1A.

Their one-piece hardware includes a programmer, tester, verifier, and even an in-circuit (but not real time) emulator. Along with development software that runs on a PC. I found both their assembler and debugger to be fast, fun, and easy to use.

Some additional startup resources appear in the sidebar.

A 6805 Programming Trick

Being a 6502 person, I never go anywhere in microland without an *indexed indirect* addressing mode. This ultra power addressing scheme lets you reach *anywhere* you want that is so much as *near* an on-the-fly *calculated* 16-bit address.

At first glance, the *Motorola* 6805 seems to lack any addressing scheme even remotely as powerful. But, as figure three shows us, there is one ultra-sneaky trick that you can pull to

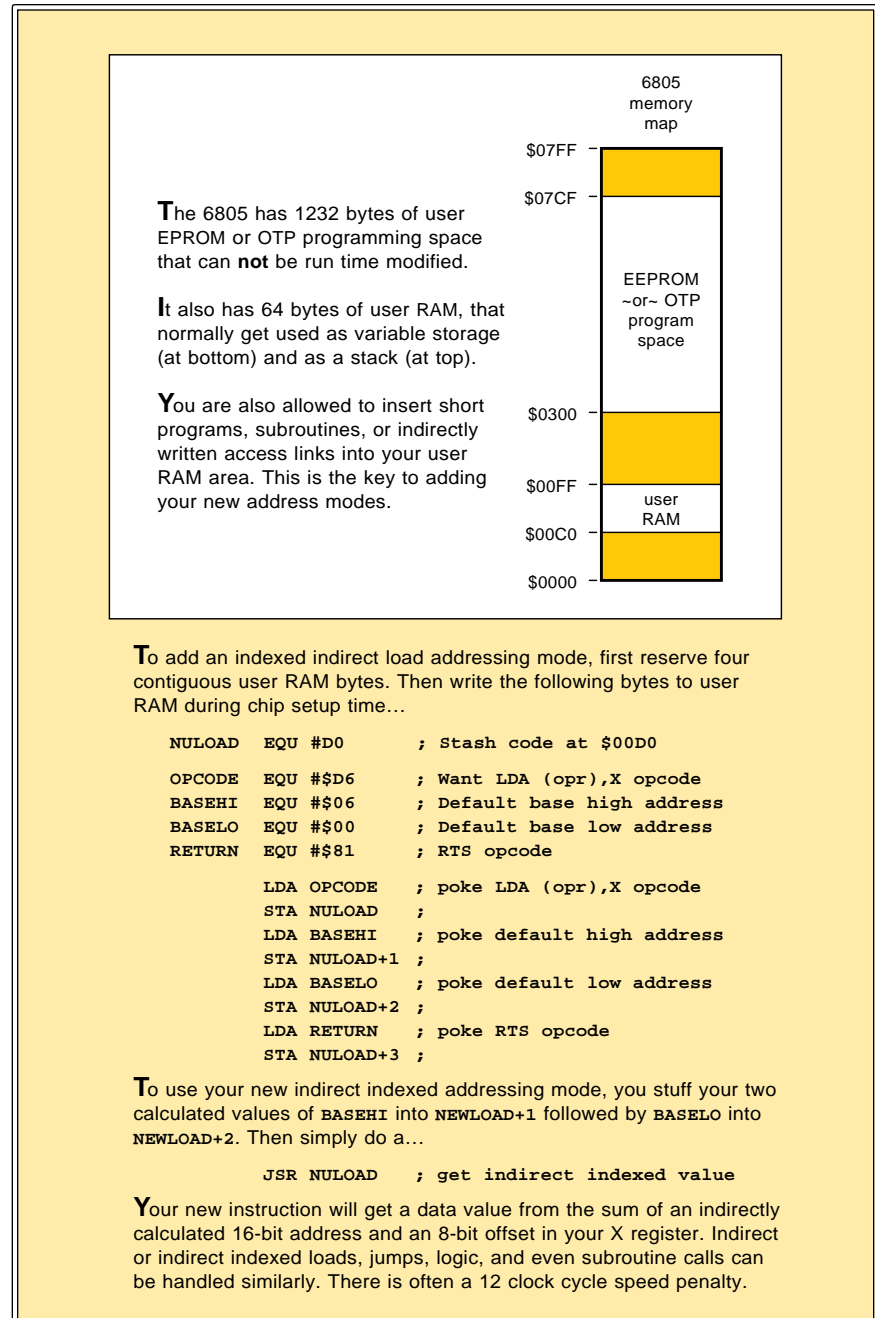


Fig. 3 – ADDING NEW ADDRESSING MODES to the 6805 microcontroller.

fake indirect indexed power.

Unlike many micros, the 6805's working registers are *inside* of its address space map. Normally, your *program* goes into the 1280 bytes of write-once memory. And your *data* and *variables* normally go in a 64 byte stash of read-write RAM. Shared with the system stack.

Now for the sneaky part: There's nothing keeping you from *executing* short blocks of *program* code *inside*

of your register and variable stash! For instance, set aside four user RAM "variables" that happen to sit beside each other. Say \$D0-D3. Now force feed this subroutine...

```

$00D0 FAKEIT LDA (XX YY),X
$00D3          RTS

```

...where HH is the *high* eight bytes of your calculated address and LL is the *low* eight bytes from your calculated address. To use your new

MICROCOMPUTER STARTUP RESOURCES

Scott Edwards Electronics
964 Cactus Wren Lane
Sierra Vista AZ 85635
(520) 459-4802

Electronics Now
500-B Bi-County Blvd
Farmingdale NY 11735
(516) 293-3000

Microchip Technology
2355 W Chandler Blvd
Chandler AZ 85224
(602) 963-7373

Micro Mint
4 Park St #20
Vernon CT 06066
(203) 875-2751

Midnight Engineering
1700 Washington Ave
Rocky Ford CO 81067
(719) 254-4558

Motorola
PO Box 1466
Austin TX 78767
(800) 521-6274

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

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

Popular Electronics
500-B Bi-County Blvd
Farmingdale NY 11735
(516) 293-3000

Western Design Center
2166 E Brown Rd
Mesa AZ 85203
(602) 962-4545

address mode, you stuff the address values you want on into HH and LL. And then call your new mode as a ordinary subroutine...

§03?? GETVAL JSR FAKEIT

Whenever you get back from this subroutine, your accumulator holds a copy of the value stashed at sum of the *calculated* 16-bit address and the offset in the X register.

You also have the hairier option of using a JMP into RAM plus a JMP back into the normal program space. Or even an indexed jump.

Among many other possibilities, you might now load, store, or jump indirect indexed. Logic, too. You can even do a JSR to an indirect indexed *subroutine*. One feature that is sorely lacking on many micros.

The only penalties for this sneaky ploy are your extra machine cycles involved and the "loss" of four bytes of user RAM.

Do note that a subroutine call on a 6805 takes *twelve* or *thirteen* clock cycles to execute. Any PIC can do the same thing in *two* clock cycles!

This Month's Contest

If you are not a 6805 person, what you have just seen may look like so much gibberish. But each and every micro family has its *insider snippets*. Short and sneaky code sequences that

do utterly amazing things. In ways previously unthunk of. As another insider snippet, we looked at a PIC generating a high quality sinewave in an astonishing *six bytes* of code back in [HACK85.PDF](#).

So, for this month's contest, just tell me your favorite insider snippet for any low end micro.

As usual, there will be a dozen or more copies of my *Incredible Secret Money Machine II* book going to the better entries. Plus an all expense paid (FOB Thatcher, AZ) *tinaja quest* for two for the best of all.

Or a tramway hunt if you prefer. The choicest (and hardest) pieces of the trace still remain. Bring your own catclaw, just in case we don't find enough on the route. Naturally, your 4WD vehicle gets an absolutely free Arizona pinstripping job.

NEED HELP?

Phone or write all your US Tech Musings questions to:

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

US email: don@tinaja.com
Web page: www.tinaja.com

More info in [GRAMTRAM.PDF](#).

Be sure to send all your *written* entries to me here at *Synergetics* and *not* to **Electronics-Now** editorial. To be fair to everyone, email entries are *not* acceptable.

Important EE Internet Sites

A detailed listing of the top one hundred EE Internet sites appeared in *E.E. Times* for July 10, 1995. Pages 75-78. I have extracted some of the more interesting of these for you in figure four's listing.

Refer to the original story or to the E.E. Times web site for more details and additional locations.

A New MIDI Book

Craig Anderton just sent me a copy of his unique *Digital Projects for Musicians* book. Helped along by Bob Moses and Greg Bartlett. And intro'd by Herbie Hancock. Some 363 oversize pages, published at \$24.95 by the *Amsco* folks.

Included are all sorts of hardware and software MIDI goodies. Chord generator, data monitors, controllers, tempo transmitters, multiple effects, patch bays, relay drivers, a random translator, and a keyboard mapper.

Software and development tools are separately available. One source is *PAVO*. Most projects use the 6805 microcontroller.

Craig's earlier *Electronic Projects for Musicians* was a classic.

Some additional electronic music resources appear in [RESBN43.PDF](#). One good source for MIDI and other electronic music books in general is the *MIX Bookshelf*.

New Tech Lit

From *International Rectifier*, a free new 1700 page *Hexfet MOSFET Designer's Manual*. And from *Texas Instruments*, an equally thick *MOS Memory Data Book*.

From *Atmel*, free samples of their new serial EEPROMS. Non-volatile memories with densities to 64K and operating voltages on down to 1.8 volts. From *Maxim*, the new *Power Supplies Design Guide*. Including many dozens of ready-to-go circuits.

Free samples are also offered.

Sysop News & Cyberworld Report is a tabloid for online sysops.

Biophotonics International is a

http://aip.org	American Institute of Physics
http://www.info.apple.com	Apple Computer technical library
http://www.bellcore.com	Bell Telephone Laboratories
http://www.civent.carlton.ca/eci	Carlton University case studies
http://www.cmu.edu	Carnegie-Mellon university
http://www.englib.cornell.edu	Cornell University engineering library
http://www.monster.com	East coast technical employment
http://www.e2w3.com	Electrical engineer's hotlist
http://techweb.cmp.com	E.E. Times magazine
http://www.epri.com	Electric Power Research Institute
sci.electronics	Electronic circuits database
http://www.eff.org	Electronic Frontier Foundation
http://www.commerce.net	Electronic marketplace catalog
Gopher to: enews.com	Electronic newsstand online magazines
sci.electronics.repair	Electronic servicing and repair
http://www.careersosaic.com	Employment database links
comp.software.eng	Engineering software listings
http://galaxy.einet.net/einet/einet.html	Enterprise integration network
FTP to: prep.ai.mit.edu	Free Software Foundation
http://www.ge.com	General Electric online database
http://nearthnet.gnn.com	Global network navigator
http://www.semi.harris.com	Harris Semiconductor technical data
http://www.ieee.org	Institute of Electrical & Electronic engineers
http://www.intel.com	Intel technical product data
http://www.ibm.com	IBM online database
http://www.www.spie.org	International Society for Optical Engineering
http://www.internic.net	InterNIC net locator
http://www.atp.linl.gov	Lawrence Livermore National Laboratory
FTP to: ra.nrl.navy.mil	Macintosh Engineering Users Association
http://www.marshall.com	Marshall Industries semiconductor reference
http://www.mitl.mit.edu	Massachusetts Institute of Technology
http://www.mathworks.com	Mathworks help and technical support
http://www.mrc.uidaho.edu	Microelectronics Research Center
http://www.motserv.indirect.com	Motorola online data library
http://hypatia.gsfc.nasa.gov	National Aeronautics and Space Admin
http://www.nist.gov	National Institute Science & Technology
http://www.nsc.com	National Semiconductor product information
http://www.nec.com	NEC semiconductor components
http://ageninfo.tamu.edu/jobs.html	Online employment agency links
sci.optics	Optoelectronic resources
sci.physics.research	Physics and physical sciences
http://www.dynemo.ecn.purdue.edu	Purdue University ee labs
http://www.sandia.gov	Sandia National Laboratory
http://www.sri.com	Sarnoff Research Institute
http://www.stanford.edu	Stanford University design research center
sci.math	State of the art mathematics
http://www.sun.com	Sun Microsystems access links
http://sunsite.unc.edu/unchome.html	Sun Microsystems technology exchange
http://www.ti.com/sci/docs/schome.htm	Texas Instruments technical data
http://www.berkeley.edu	University of California Berkeley research
http://bunny.cs.uiuc.edu/jobs	University of Illinois career center
http://www.ee.umn.edu	University of Missouri Rolla
http://town.hall.org	US patent database
http://www.uspto.gov	US patent and trademark office
sci.electrical-wiring	Wiring standards
http://www.yahoo.com	Yahoo Internet directory

For more details on these sites: <http://techweb.cmp.com/eet/docs/eetff.html>

Fig. 4 – IMPORTANT INTERNET SITES for electronic engineering.

brand new trade journal centering on uv, visible, ir, and submillimeter light solutions for biotechnology and medicine. A tutorial on new mystery band applications (which they call T-Rays) showed up in the July 95 edition on pages 58-59.

Sports radar systems are sold by *Radar Sales*. Uses include baseball,

jet skis, race cars, boating, and RC Models. Several are recycled police speed radars. Others are new units that have been designed from the ground up for sports uses.

I still get lots of calls over the VCR codes. These are highly proprietary. The leading resource here is *Gem Star Development Corp*. Expect some

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**

CMOS AND TTL COOKBOOKS

Millions of copies in print worldwide. THE two books for digital integrated circuit fundamentals. About as hands-on as you can get. **\$28.50 each.**

INCREDIBLE SECRET MONEY MACHINE II

Updated 2nd edition of Don's classic on setting up your own technical or craft venture. **\$18.50**

LANCASTER CLASSICS LIBRARY

Don's best early stuff at a bargain price. Includes the CMOS Cookbook, The TTL Cookbook, Active Filter Cookbook, PostScript video, Case Against Patents, Incredible Secret Money Machine II, and Hardware Hacker II reprints. **\$119.50**

LOTS OF OTHER GOODIES

Ask the Guru I or II or III	\$24.50
Hardware Hacker II, III or IV	\$24.50
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
Synergetics Surplus Catalog	FREE
Technical Insider Secrets	FREE

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A Book/Disk combination crammed full of free fonts, insider resources, utilities, publications, workarounds, fontgrabbing, more. For most any PostScript printer. Mac or PC format. **\$29.50**

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Ongoing details on Book-on-demand publishing, a new method of producing books only when and as ordered. Reprints, sources, samples. **\$39.50**

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For most individuals, patents are virtually certain to result in a net loss of sanity, energy, time, and money. This reprint set shows you Don's tested and proven real-world alternatives. **28.50**

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The reprints from all Don's Midnight Engineering columns. Includes a broad range of real world, proven coverage on small scale technical startup ventures. Stuff you can use right now. **\$24.50**

RESOURCE BIN I

A complete collection of all Don's Nuts & Volts columns to date, including a new index and his master names and numbers list. **\$24.50**

FREE SAMPLES

Check Don's Guru's Lair at <http://www.linaja.com> for interactive catalogs and online samples of Don's unique products. Searchable reprints and reference resources, too. Tech help, hot links to cool sites, consultants. email: don@linaja.com

FREE US VOICE HELPLINE

VISA/MC

SYNERGETICS
Box 809-NV
Thatcher, AZ 85552
(520) 428-4073

NAMES AND NUMBERS

Amsco Publications
257 Park Avenue South
New York NY 10010
(212) 886-6500

Atmel
2125 O'Nel Drive
San Jose CA 95131
(408) 441-0311

Biophotonics International
PO Box 4949
Pittsfield MA 01202
(413) 499-0514

Gem Star Development
135 N Los Robles #870
Pasadena CA 91101
(818) 792-5700

GEne PSRT
401 N Washington Street
Rockville MD 20850
(800) 638-9636

Infinite Energy and CFNET
PO Box 2816
Concord NH 03302
(603) 228-4516

International Rectifier
233 Kansas Street
El Segundo CA 90245
(310) 322-3331

KeelyNet BBS
Box 1031
Mesquite TX 75149
(214) 324-3501 BBS

Maxim
120 San Gabriel Drive
Sunnyvale CA 94086
(800) 998-8800

Microchip Technology
2355 W Chandler Blvd
Chandler AZ 85224
(602) 963-7373

MicroMint
4 Park Street Ste 20
Vernon CT 06066
(203) 875-2751

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

PAVO
PO Box 47
Buchanan MI 49107
(800) 546-5461

Radar Sales
5485 Pineview Lane
Plymouth MN 55442
(612) 557-6654

Skeptical Inquirer
PO Box 703
Buffalo NY 14226
(716) 636-1425

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

Sysop News & Cyberworld
8125 SW 21st Street
Topeka KS 66615
(913) 478-3157

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

open alternatives "real soon now".

I've just added a [MSINPROP.PDF](#) magic sinewave file to my website at www.tinaja.com. The already highly impressive magic sinewaves we saw in last month's EN column have also been dramatically improved. This is an outstanding new power electronics opportunity for you.

One that promises to revolutionize

power electronics forever. Especially for home energy management.

A new disabled and handicapped resource directory has also gotten added as [RESBN44.PDF](#).

A reminder that my *Active Filter Cookbook* is once again back in print. Autographed texts are now available through my [Synergetics Press](#).

Reselling partners are welcome. ♦