

# Tech Musings

July, 2000

Some RFID resources  
PostScript trig functions  
Hydrogen scams and fiascos  
Steplocked Magic Sinewaves  
Are VMSK/2 & AAPSK bogus?

The web is full of outright scams to produce hydrogen by violating fundamental physical laws. To me, these all look like investment stock plays aimed at the cluelessly gullible. Plain and simple.

Although I'm sure their supporters strongly feel otherwise.

One claims that fractional energy states exist lower than those allowed by quantum mechanics. Another arcs carbon underwater in violation of thermodynamic irreversibility.

Another injects microwaves into an engine cylinder. A fourth claims miracle electrolysis efficiencies. By way of a thoroughly discredited pulse or high voltage technique.

A Canadian penny stock is starting to look just like a Canadian penny stock. Another exploits a high profile circuit of his tent show populist "not even wrong" hystronics. An idiotic decades-old scam still hypes hugely inefficient "overunity" motors.

Trolling newsgroup posts continue to be made by ripped-off and clueless investors in terminal denial of their having been done in by a deceased Ohio "water car" swindler.

An apparent Phillipine water car fiasco has now been recycling itself for three decades. And a final scam championed by a rock musician has his minions still selling \$15 plans for a ridiculous dynamic brake.

Uh, let's review: **There's no known way to store hydrogen today which is safe enough, dense enough, or cheap enough for personal vehicle use.**

Except for hydrocarbon fuels.

If pressurized to 80 PSI, a 12 foot diameter speherical vessel would be needed for useful vehicle range. Such a tank would have something around 700 tons of force on it. The minimum recommended DOT orange book day time no-wind evacuation distance is 2640 feet for such a hazmat situation. As in [hazmat.dot.gov/gydebook.htm](http://hazmat.dot.gov/gydebook.htm) And your best recommended tool is a powerful pair of binoculars.

Sadly, all known hydrogen storage methods are worse or not here yet.

The hydrogen storage problem is the crucial gotcha. If you really want to do something useful, solve it.

It turns out that electrolysis is such a poor way to produce hydrogen that it is never used commercially for bulk energy apps. In particular, stainless steel is an atrocious electrode choice.

Why so? Because of the hydrogen overvoltage of iron and its passivated surface. Instead of using electrolysis, methane reformation is the standard industrial process today.

But the methane really has to want to reform.

A final point is that solar electric to electrolysis to hydrogen is clearly a monumentally stupid bet today.

Solar electricity is far too valuable to waste on electrolysis. It is also a much "better" energy way higher up

on the exergy chain, since you can do more things with it far more easily and far more efficiently.

The inefficiencies and costs of all these systems today mean they are net energy sinks which are simply destroying gasoline.

With the possible partial exception of a few rare and remote gas wells, **no terrestrial non-nuclear means is known to produce hydrogen which does not use up considerably more energy than the hydrogen could store as an energy carrier or transport media.**

Your best starting point on all this is where it has been for the last few centuries: Faraday's notebooks. You can easily find these as Briticannica Great Books #45. Faraday (along with myself and every other even remotely credible researcher since) felt that...

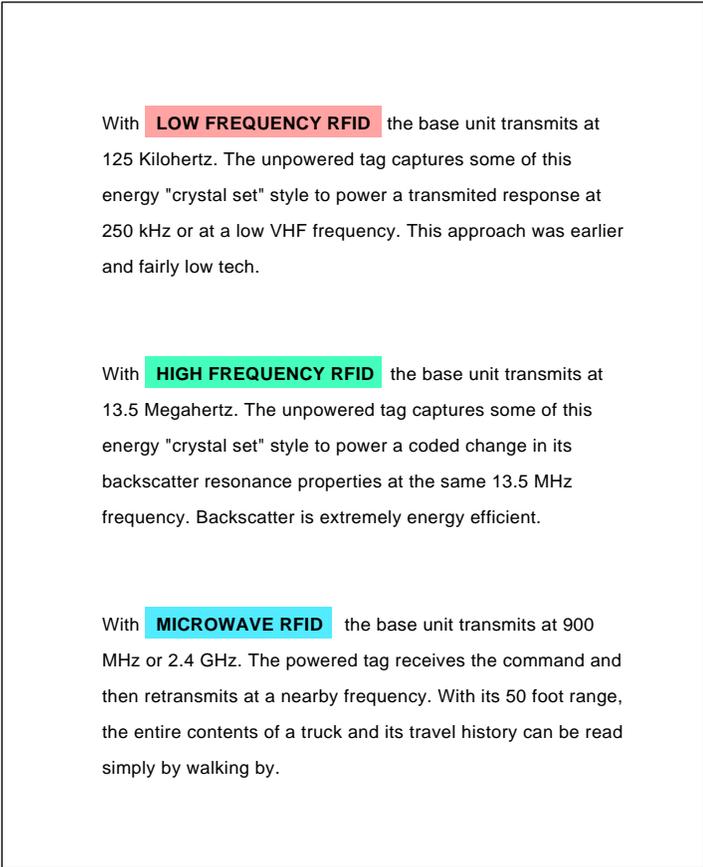


Fig. 1 – POPULAR RFID SCHEMES vary in their transmit and response frequencies and methods.

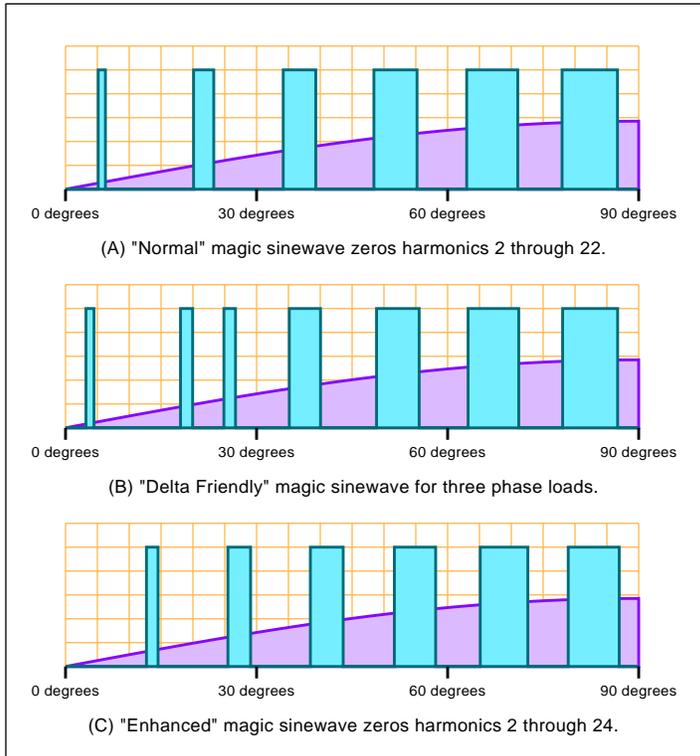


Fig. 2 – STEPLOCKED MAGIC SINEWAVE waveforms. Pulse timing must be exact to fully cancel all low harmonics.

- (1) The net energy that is required to dissociate hydrogen is independent of method.
- (2) One electron has to be added for each hydrogen atom.
- (3) Approximately two electron volts of energy are needed.

All these rules are non-negotiable. Observations to the contrary ~are~ experimental error. Your question is never whether the errors occurred. It is always finding exactly which errors were made in what manner. Finding the source of these errors can end up challenging and educational.

If you feel these rules are in error, please show me which centerfold of *Science* magazine you have appeared in and which aisle of Wal-Mart I can find your product on.

Yes, modest amounts of hydrogen injection can very much improve the behavior of a gasoline engine. But if and when the process proves feasible, the hydrogen will likely be gotten by fuel modification or by exhaust gas driven reformation. Or another way that makes more thermodynamic and economic sense than electrolysis.

More on hydrogen resources at my [www.tinaja.com/h2gas01.html](http://www.tinaja.com/h2gas01.html) and in my file [BASHPSEU.PDF](#)

### Waiting for the RFID Cows to Come Home

There's bunches of new interest in an emerging field known as *RFID*, or *Radio Frequency Identification*.

RFID literally can watch your cows come home and make sure each one gets into her own stall. Or keep track of library books. Or stop shoplifting.

Or assign parking spaces.

Or give Percival Pussival exclusive use of his private cat door. Or find stolen cars or missing dogs. Or label friendly military targets. Or hazmat in transit. Or buy groceries. Or pay bus fares or bridge tolls. Or keep tabs on wandering boxcars.

RFID consist of at least two units. The base unit is the *transmitter* or the *sensor*. The moving unit is a *tag*, an *implant*, or a *transponder*. Most tags are passive in that they do not need any internal batteries.

Depending on the system used, the base unit typically sends out some RF energy that is intercepted by the tag.

## "DELTA FRIENDLY" SINEWAVE ANDC28 - 57/100

**SUMMARY:** This steplock-28 "constant amplitude increments" magic sinewave is fully delta friendly. Harmonics 2 through 22 are virtually zero. The first major harmonics are the 23rd and 25th. Harmonic amplitudes are relative to the fundamental. Filtered "f" harmonics assume a filter of an "integrating" or 1/H or 1/f response. An 0.001 degree or better timing accuracy is required.

Desired Amplitude: 0.57  
 Actual Amplitude: 0.569998  
 Actual Power: 0.324897  
 Distortion 2H-22H: 0.0008237999%  
 First strong harmonics: 23 and 25  
 Pulses per sine cycle: 28  
 Total switching events: 56  
 Delta Friendly: Yes

|                   |              |               |
|-------------------|--------------|---------------|
| P1 start: 3.2089  | end: 4.4724  | delta: 1.2635 |
| P2 start: 0.0     | end: 0.0     | delta: 0.0    |
| P3 start: 18.0554 | end: 19.96   | delta: 1.9046 |
| P4 start: 24.8653 | end: 26.6919 | delta: 1.8266 |
| P5 start: 35.1347 | end: 40.04   | delta: 4.9053 |
| P6 start: 48.8375 | end: 55.5276 | delta: 6.6901 |
| P7 start: 63.2089 | end: 71.1625 | delta: 7.9536 |
| P8 start: 78.0554 | end: 86.6919 | delta: 8.6365 |

|                   |                   |                    |
|-------------------|-------------------|--------------------|
| H3: -2.66285e-07  | H19: 1.26135e-06  | H19f: 6.63869e-08  |
| H5: 5.51211e-06   | H21: 3.80408e-08  | H21f: 1.81146e-09  |
| H7: 5.19256e-06   | H23: 0.69968      | H23f: 0.0304209    |
| H9: 2.21904e-07   | H25: -0.49741     | H25f: -0.0198964   |
| H11: 2.14239e-06  | H27: -2.36698e-07 | H27f: -8.76659e-09 |
| H13: 4.0967e-08   | H29: 0.213105     | H29f: 0.00734844   |
| H15: 6.21332e-08  | H31: 0.140614     | H31f: 0.00453593   |
| H17: -2.05196e-06 | H33: 1.69454e-07  | H33f: 5.13498e-09  |

c2sd = 0.0  
 c2ed = 0.0  
 c3sd = 0.0  
 c3ed = 0.0  
 c4sd = 0.0  
 c4ed = 0.0  
 c5sd = 0.0  
 c5ed = 0.0  
 varx = 3.635%.

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Fig. 3 – A DELTA FRIENDLY steplock magic sinewave example.

The tag first may "steal" some of this energy, change it to dc and capacitor store it for its own use. The tag then responds, either altering its rf profile or returning new energy.

The coding of the return might act like a bar code. Or give you a serial id number and other data. For instance, a hog implant might also include the core body temperature. While simple tags work one-way only, fancier ones can be written and read. Storing, say, Elsie's milk production. Or the shock history of a package in transit. Or the GPS position. Or a remaining "smart card" cash balance.

Figure one shows us three popular RFID schemes. Giving you choices in cost, range, and size.

An older RFID scheme transmits at 250 kiloHertz and responds either at 125 kHz or at VHF The low transmit frequency acts as a fairly efficient air core transformer. Such that tag power can get extracted and stored "crystal set" style. The [Holtek](#) HT6730 is one typical VLF-only example. The usual range is six inches or so.

Instead, most newer approaches to RFID make use of...

### The Backscatter Method

It sure would be nice if the tag did not have to transmit anything at all. Thus simplifying your tag circuits and very much lowering tag power. That's just what the newer RFID *backscatter* methods are all about.

Most resonant circuits have a way of "sucking in" surrounding energy. Ferinstance, if you take a large tuned loop antenna and set it close to any AM radio, your nighttime reception will dramatically improve.

Hams once used "grid dip" meters. Where a tunable oscillator was placed near a tuned circuit. A drop in energy was noted at the resonant frequency.

Similarly, radar works by blasting a target with rf energy. The target then reflects energy back for measurement or display. If the target is resonant, it returns a very strong signal.

Reflected or returned radar energy is called *backscatter*. You can think of backscatter as "rebroadcasting".

So, all a backscatter tag has to do is switch a resonant tank into or out of resonance at a coded rate. Or change its resonance frequency. Either takes little energy or fancy circuitry.

```
% POSTSCRIPT ACOS & ASIN TRIG PROCS
% =====
% Copyright c 2001 by Don Lancaster & Synergetics, Box 809, Thatcher, AZ, 85552
% (520) 428-4073 Email: don@tinaja.com Website: http://www.tinaja.com
% Consulting services available per http://www.tinaja.com/info01.html
% All commercial rights and all electronic media rights fully reserved.
% Linking welcome. Reposting expressly forbidden. Version 1.2
% These four PostScript utilities generate arcsine and arccos capabilities,
% both in traditional "atan" and more convenient formats. Predefine them before
% use in your PostScript code.
% "arc" or "inverse" operators are used in trig to get from a sine, cosine,
% tangent, or other function value from the underlying primary angle in degrees.
% For instance, arcsine (0.5) would be 30 degrees. Only the atan operator is
% initially defined in PostScript.
% These utilities work by "completing the triangle" of sides x and y and
% hypotenuse (x^2 + y^2)^0.5 = 1 and then calling PS atan given x and y.
% The first two utilities are in the same format as the existing PostScript
% atan operator. Input TWO triangle sides as noted...
/acos {2 copy dup mul exch dup mul sub sqrt exch pop
exch atan} def % arccosine use - xside hypotenuse acos -
/asin {2 copy dup mul exch dup mul sub sqrt exch pop
atan} def % arcsine use - yside hypotenuse asin -
% These two utilities are in a more convenient "input trig, get degrees" format.
% They call the above two procs..
/trig.acos {1 acos} def % arccosine from input of trig value
/trig.asin {1 asin} def % arcsine from input of trig value
% Demo -- Send to Distiller. Remove or alter before reuse --
1 2 acos == 1 2 asin == 0 1 acos == 0 1 asin == 0.5 trig.acos ==
1 trig.acos == 0 trig.acos == 0.5 trig.asin == 1 trig.asin == 0 trig.asin ==
% results should be 60.0 30.0 90.0 0.0 60.0 0.0 90.0 30.0 90.0 0.0
% Demos and sourcecode available at http://www.tinaja.com/post01.html and at
% http://www.tinaja.com/acrob01.html Consulting per don@tinaja.com
```

Fig. 4 – POSTSCRIPT ASIN and ACOS custom trig procs.

[Microchip Technology](#) is really big on 13 MHz backscatter RFID. Their MCRF360 is typical and can be found in their *microID* line. Up to 50 tags can be interrogated interference free through an anticollision algorithm. Lots of these data sheets and ap notes and tutorial design guides are up at [www.microchip.com](#)

Check them out.

[Micron's MicroStamp](#), [DuraTracker](#) or similar systems operate either near 900 MHz or at 2.4418 GHz. Although their micropower tags require battery power, they have a fifty foot range.

And do such neat tricks as let you walk by the back of any 18-wheeler and catalog the entire cargo and the recent travel history of the truck.

I have gathered some useful RFID info together for you as this month's resource sidebar. More RFID links are up at [www.rwprox/WWW.html](#)

Also see the [RFID News](#) website.

A RFID search using that new [PDF](#) button on my website quickly leads you to lots of useful and otherwise hard-to-find tutorials. As does either of my [HOTBOT](#) or [GOOGLE](#) buttons.

Cole's *Fundamental Constraints on RFID Tagging Systems* does seem to be a good starting point here.

One important but expensive book is the *RFID Handbook*. More on this at [www.tinaja.com/amlink01.html](#)

Your major trade journals include

*Applied Microwaves & Wireless  
Automatic ID News  
Card Technology  
Data Capture Communications  
Data Capture Report  
Data Capture Reseller  
ID Systems  
ITS World  
Personal Identification News  
Wireless Design & Development  
Wireless Systems Design*

SOME RFID RESOURCES

**A.I.M.**

634 Alpha Drive  
Pittsburgh PA 15238  
(412) 963-8588  
[www.aimglobal.org](http://www.aimglobal.org)

**Brady**

PO Box 2999  
Milwaukee WI 53201  
(800) 368-3374  
[www.bradyrfid.com](http://www.bradyrfid.com)

**Checkpoint Systems**

101 Wolf Drive  
Thorofare, NJ 08086  
(800) 257 5540  
[checkpointsystems.com](http://checkpointsystems.com)

**Destron Fearing**

490 Villaume Avenue  
South St Paul MN 55075  
(651)455-1621  
[www.destron-fearing.com](http://www.destron-fearing.com)

**Gemplus**

3 Lagoon Dr Ste 300  
Redwood City CA 94065  
(650) 654-2900  
[www.gemplus.com](http://www.gemplus.com)

**Holtek Holmate**

48531 Warm Spring Blvd,  
Suite 413, Fremont, CA 94539  
(510)252-9880  
[www.holmate.com](http://www.holmate.com)

**ID Micro**

1019 Pacific Ave 13th Fl  
Tacoma WA 98402  
877.395.1479  
[www.idmicro.com](http://www.idmicro.com)

**Indala**

5201 Topllview Drive  
Rolling Meadows, IL 60080  
(410)-712-6480  
[motorola.com/smartcard](http://motorola.com/smartcard)

**Intersoft**

205 Research Park Dr  
Tullahoma TN 37388  
(931)454-2305  
[www.intersoft-us.com](http://www.intersoft-us.com)

**Intermec**

6001 36th Avenue West  
Everett, WA 98203-9280  
(425) 348-2600  
[home.intermec.com](http://home.intermec.com)

**Korteks**

2227 Johns View Way  
San Diego CA 91977  
(619) 303-5700  
[www.korteks.com](http://www.korteks.com)

**Microchip Technology**

2355 W Chandler Blvd  
Chandler AZ 85224  
(480) 786-7200  
[www.microchip.com](http://www.microchip.com)

**Micron Duratracker**

625 Stratford, Ste 1000  
Meridian ID 83642  
(800)642-7678  
[www.micron.com](http://www.micron.com)

**Minec**

PO Box 7278  
SE-187 14 Taby Sweden  
46-8-630 92 92  
[www.minec.com](http://www.minec.com)

**RFID Inc**

3538 Peoria St #505  
Aurora CO 80010  
(303) 366-1234  
[www.rfidinc.com](http://www.rfidinc.com)

**Synergetics**

Box 809  
Thatcher AZ 85552  
(520) 428-4073  
[www.tinaja.com](http://www.tinaja.com)

**Tagmaster**

Electrum 410 SE-164  
40 Kista Sweeden  
46-8-6321950  
[www.tagmaster.com](http://www.tagmaster.com)

**Telsor**

PO Box 4423  
Englewood CO 80155  
303 622 8877  
[www.telsor.com](http://www.telsor.com)

**Trovan**

Electronic Identification  
(804) 565-1288  
[rfidnews.com](http://rfidnews.com)  
[www.trovan.com](http://www.trovan.com)

**Y-Tex**

PO Box 1450  
Cody WY 82414  
(307)587-5516  
<http://www.y-tex.com>

Some RFID systems houses include *Minec*, *ADC Systems GemPlus*, *Indala*, *Korteks*, *Brady*, *Intermec*, *RFID Inc.*, *ID Micro*, *Tagmaster*, *Telsor*, or *Intersoft*.

*Trolleyscan* has a superefficient tag energy conversion process. As do the folks at *Checkpoint*.

One leading supplier of ag implant transponders is *Destron Fearing*, while *Trovan* is working on worldwide pet identification standards. *Y-tex* is yet another inplant transponder source.

An industry trade association is the *AIM*, or *Association of Identification Manufacturers*

One major RFID ap I'd like to see developed further are *isopods*. These are tennis ball shaped devices that you can clip onto power wires.

*Isopods* can report the current and power consumption for home energy control and industrial repairs. More in our *Hardware Hacker Archives* up at <http://www.tinaja.com/hack01.asp> There's lots to be explored here.

Steplocked Magic Sinewaves

I've long been fascinated by *Magic Sinewaves* These are long sequences of ones and zeros that generate low distortion high power sinewaves by on-off switching of a dc source.

For everything from electric cars to solar inverters to mobile power to ac motor controls to pf correction to telephone ringers. More details are at [www.tinaja.com/magsn01.asp](http://www.tinaja.com/magsn01.asp)

Recently, I've been exploring what

I call *steplocked* magic sinewaves.

These are quite easy to synthesize and analyze. Steplocking is a brand new multi-billion dollar green energy savings opportunity. The technique also has the amazing property that *any chosen number of sequential low harmonics can be forced to zero!*

My steplocked magic sinewaves are similar to plain old PWM pulse width modulation, except: (A) all the pulses are locked to the generated sinewave; (B) Far fewer pulses than normal are used; and (C) the pulse positions and widths must be carefully chosen.

The fewer pulses are the secret to much higher switching efficiencies.

Figure two shows us one quadrant of several steplocked magic sinewave options. In the "normal" sequence of 2a, six uniformly spaced pulses have their widths *precisely* adjusted to give the needed energy of a fundamental frequency sinewave.

Once you have your first quadrant, you'll mirror it for your second, then turn your mirrored pair upside down for your third and fourth.

Working in quadrants drops your data storage by four and eliminates all dc terms, all even harmonics, and all odd cosine terms.

SELECTED RFID BOOKS

Klaus Finkenzeller, *RFID Handbook*

R. Geers, *Electronic Tracking of Animals*

Joanne Lerose, *Guide to Understanding and Using RFID*

Dominick Paret, *RFID and Contactless Smart Cards*

For more book details, see [www.tinaja.com/amlink01.html](http://www.tinaja.com/amlink01.html)

## NAMES AND NUMBERS

**Adobe PostScript**

PO Box 7900  
Mountain View CA 94039  
(800) 833-6687  
[www.adobe.com](http://www.adobe.com)

**US DOT**

400 Seventh St SW  
Washington DC 20590  
(800) 467-4922  
<http://hazmat.dot.gov>

**EDN Magazine**

275 Washington St  
Newton MA 02158  
(617) 964-3030  
[www.ednmag.com](http://www.ednmag.com)

**G.N. Nettetst**

63 Souts Street  
Hopkinton MA 01748  
(800) 233-3800  
[www.gnnettest.com](http://www.gnnettest.com)

**Kindt-Collins**

12651 Elmwood Avenue  
Cleveland OH 44111  
(800) 321-3170  
[www.kindt-collins.com](http://www.kindt-collins.com)

**Oxbridge Mediafinder**

150 5th Ave #202  
New York NY 10011  
(212) 741-0231  
[www.mediafinder.com](http://www.mediafinder.com)

**Science/AAAS**

1333 H St NW  
Washington DC 20005  
(202) 326-6400  
[www.sciencemag.org](http://www.sciencemag.org)

**Super Circuits**

One Supercircuits Plaza  
Leander TX 78641  
(800) 335-9777  
[www.supercircuits.com](http://www.supercircuits.com)

**Supertex**

1225 Bordeaux Dr  
Sunnyvale CA 94088  
(408) 744-0100  
[www.supertex.com](http://www.supertex.com)

**Synergetics**

Box 809  
Thatcher AZ 85552  
(520) 428-4073  
[www.tinaja.com](http://www.tinaja.com)

**Texas Instruments**

PO Box 655303  
Dallas TX 75380  
(800) 336-5236  
[www.ti.com](http://www.ti.com)

**21st Century Books**

PO Box 2001  
Breckenridge CO 80424  
(970) 453-9293  
[www.tfcbooks.com](http://www.tfcbooks.com)

More details in [MUSE90.PDF](#).

If you send this exact waveform to an *integrator* or *low pass filter* (such as the inductance in a motor) and look at all the "error" energy which is not the fundamental, you'll find the first non-zero harmonics are the 23rd and 25th! You could think of these as the residue from a 24th harmonic *carrier* whose phase cyclically alternates.

The object here is to make all of your energy either fundamental or carrier, leaving nothing for the other low harmonics. Thus forcing them to zero. In this example, "none" means a total harmonic distortion 2-22 that is under 0.00823 percent.

Detailed magic sinewave catalogs and JavaScript calculators are now up at [www.tinaja.com/magsn01.asp](http://www.tinaja.com/magsn01.asp).

Consulting services are offered by way of [don@tinaja.com](mailto:don@tinaja.com)

## The Bad Stuff

Any magic sinewave has to make a compromise between stuff you want (that smooth fundamental) and stuff you do not (all the sharp switching

corners). How do stepped magic sinewaves compare?

As with my other magic sinewaves, stepping works by forcing all of the harmonics as high in frequency as possible for easy filtering.

On the plus side, harmonics two through a selected maximum are all zero in theory, and end up darn little in practice. The low harmonics even *improve* with low amplitudes. Design is straightforward, and only modest computer time is needed.

You have a nearly infinite possible

## NEED HELP?

Phone or email 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](mailto:don@tinaja.com)  
Web page: [www.tinaja.com](http://www.tinaja.com)

sets of amplitudes. Only 26 storage bytes are required per amplitude in our "normal" example. Again, the low number of switching transitions used can end up vastly more efficient than classic PWM techniques.

On the debit side, all the steplock delay values do have to be amazingly precise to force weak low harmonics. Something like 1 part in 30,000 error can make a difference. Which means that you'll need timing accuracies of a few microseconds at 60 Hertz. And that you may want to separate setting your frequency and amplitude. With use of a phase locked clock.

Even though there is a zero third harmonic, this "normal" waveform is not yet three phase friendly. Ideally, you want to only drive the terminals on an unmodified three phase motor. Without splitting out your windings or using six drivers.

To be three phase friendly, you'll have to obey this strange rule: **Any three waveform sample triads spaced by 120 degrees must individually sum to precisely zero.**

Our "normal" magic sinewave can sneakily be made three phase friendly by splitting and adjusting its narrow pulses as shown in figure 2b. A delta friendly example is in figure three.

Another steplock restriction is that the technique works best with power electronic frequencies of 50 to 400 Hertz. Clock frequencies may get way out of hand for faster use.

Steplocking does have the big time gotcha common with all PWM: Your first two *uncontrolled* odd harmonics will be very strong. Possibly as strong as your fundamental.

Filtered by simple integration, they remain around 3 percent amplitude and 0.09 percent power.

Which is a typical design tradeoff: overspecify one goal (such as forcing lots of zero low harmonics) and other problems are sure to crop up.

If you can add a second lowpass filter pole, your remaining distortion could be greatly reduced. Load inertia will sometimes provide this service free of charge.

Yet another steplocking restriction is that it only works over a somewhat limited frequency or speed range. 5:1 or so without mods.

But higher sequences or tracking filters can easily be added.

### Synthesis Secrets

Adding magic sinewave pulses can zero out more odd harmonics. But at the cost of more efficiency-robbing switch transitions. Conversely, less pulses can be used to raise efficiency.

The number of adjustable steplock quadrant edges sets the number of low odd harmonics you can force to zero. By using six pulses and twelve edges, for instance, you can force your fundamental to a desired amplitude and the 11 harmonics 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, and 23 to zero.

Delta friendly gets trickier, because certain pulse edges have to track each other. In our figure 3 example, there are fourteen edges, but only seven are independently adjustable. The seven non-adjustable edges force all the odd triad harmonics (3, 9, 15, 21, etc...) to zero. The seven adjustable edges let you control the fundamental and the six remaining low odd harmonics of 5, 7, 11, 13, 17, and 19. Thus zeroing out everything through the 22nd.

Note that all even harmonics (plus the dc and cosine terms) will already be zero when using this potent new steplock scheme. Further design help on step-locked magic sinewaves is at [www.tinaja.com/magsn01.asp](http://www.tinaja.com/magsn01.asp)

### Oddball PostScript Math

One of the beauties of the general purpose PostScript language is that you can define anything at any time,

building on what you already have.

For my steplocked magic sinewave math research, I needed an *acos* or *arccosine* function. One that input a cosine of an angle returns the angle itself. PostScript only comes fairly close with its *atan* operator.

So, as our PostScript utilities for this month, I have shown you some simple transforms that get you from the existing *atan* operator to the *asin* or *acos* of your choice .

Basically, you redefine the names on a trig triangle and work your way around as needed. Per figure four.

### New Tech Lit

There's apparently a new group of wireless data encoding schemes that seems to promise surprisingly narrow bandwidths. Such as five times a 57K modem's abilities on any plain old voice grade phone line.

Or a hundred CD quality programs in a typical FM radio channel. It is called VMSK/2, short for *one-half very minimum phase-shift keying*.

Related is AAPSK, an acronym for *Alternate Aperture Phase-Shift Keying*. An *intro* appears on page 44 of *EDN* for August 7, 2000.

Web sites are [www.vmsk.org](http://www.vmsk.org) and at [www.castleen.com/alpha/vmsk1.html](http://www.castleen.com/alpha/vmsk1.html)

Because the Shannon bandwidth limit is set by thermodynamics, at least some insiders strongly feel the scheme is nothing but bad labwork.

[Click here](#) for an analysis.

Zero cost online access to Ulrich's Periodicals Dictionary seems to have been frustratingly difficult recently. One useful free alternative is *Pub List* at [www.publist.com](http://www.publist.com) Thankfully, the superb Oxbridge service has returned to the web at [www.mediafinder.com](http://www.mediafinder.com).

From *Texas Instruments*, a new *Analog and Mixed Signal Designer's Guide*. Some very small ac line power supply parts that can fit *inside* the power plug are available as the LR8 from *Supertex* and the 830 series from *Bit Technologies*. Yes, the latter even includes full safety isolation.

Unusual wax products are sold by the *Kindt-Collins* folks.

An amazing variety of low cost video cameras is sold by *Supercircuits*. Some as cheap as \$29, others that are built into ties, caps, or glasses. A free networking *ATM Pocket Reference* can be gotten through *G. N. Nettest*

I'm not big on business books, but Thomas Friedman's *The Lexus and the Olive Tree* seems to be worth a read. It thoroughly analyzes the one world impact of the Internet revolution. You can find it on my *book access page* on my *Guru's Lair* website.

For all the fundamentals of digital integrated circuits, be sure to study copies of my *TTL Cookbook* and *CMOS Cookbook*. You can find both these at [www.tinaja.com/amlink01.asp](http://www.tinaja.com/amlink01.asp)

And a final reminder about our cash-and-carry InfoPack consulting at [www.tinaja.com/info01.asp](http://www.tinaja.com/info01.asp). ♦

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