HARDWARE HACKER

Instant transfers of programs between most microcomputers, solar energy breakthrough, reducing your home power bill, reset key protector, and more

By Marcia Swampfelder

This month Don Lancaster is off on a Tinaja Quest, so he has asked me to make one of my rare guest appearances. I do have a bunch of stuff of my own on hand, so here goes . . .

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What is a Laterally Compliant Diskette?

The *laterally compliant* diskette is a dramatic new product pioneered by *Gentry Manufacturing*. Complaint diskettes are made of a new and extremely hi-tech elastomeric material that allows them to stretch only and precisely in the radial direction. When properly packaged, a laterally complaint diskette allows instant transfers of program between microcomputers or dino systems having wildly different disk drive sizes.

For instance, Fig. 1 shows one of their first products, The LCDM 8/5. As you can see, the diskette will fit either an 8 inch drive or a 5¼" drive, simply by rotating the package a quarter turn. To download programs from a minicomputer to a microcomputer, all you do is put the LCDM diskette in the 8" drive and save your programs or files to it. Then you rotate the LCDM a quarter turn and put it into your microcomputer's drive, and then transfer the programs and files to a stock 5¼" diskette.

How does it work? There is an oval track inside the envelope. The laterally compliant diskette material goes past the 5¼" read slot in its normal size, and then gets suitably stretched as it goes past the 8" read slot at its maximum width. As you might expect, the track itself is the real breakthrough, since it has to be extremely precise and carefully temperature compensated, without being overly thick.

Several other products for the format transfer are in the beta testing stage. Gentry's LCDM-5-3 is intended for Apple compatibility, letting you freely swap programs and data between an *Apple IIe* and a *Macintosh*. As before, the package is "T" shaped. This one is, of course, smaller, since the normal size is for a Macintosh 3½" drive and the stretched size fits the 5¼" Apple drive.

To fit the smaller 3¼" drive, a small snap-in centering plug is temporarily added. This is remarkably similar to those adaptors sometimes used to let a 45-rpm phonograph record fit a combination 33/45/78-rpm turntable.

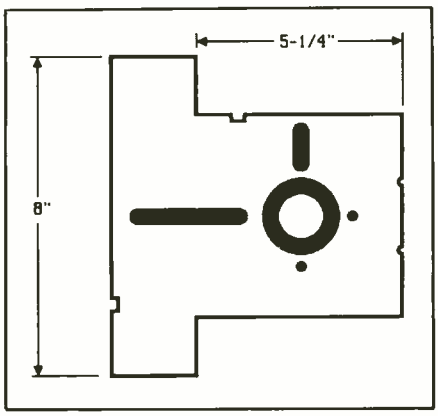

Fig. 1. The LCDM 8"/5¼" disk has a compliant elastomeric recording surface that travels an elliptical path.

Yet a third product is planned to eliminate the squabble over the nonstandard alternates to the *Sony* 3½" mini-disk. This one is more or less rectangular, except that either wall of the envelope can be snapped to any size from 2¾" to 4⅛", in increments of 1/64". A metric version is also available. Clip-on gates and shutters are available to suit the oddball sizes.

For a limited time, Gentry is offering a free evaluation sample of any one of their laterally compliant products. Contact one of their authorized factory representative for full details.

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What is the "In Situ" Solar Cell Process?

That's the big breakthrough in solar cell design that drops the cost of solar power to $90 per kilowatt. Actually, the *in-situ* (Latin for "in-place") technique is stunningly simple. Instead of refining the silicon and then building cells, you build the cells first and then refine the silicon.

The process starts with ordinary fine white beach sand, or silicon dioxide. After cell fabrication, the sand is chemically treated. The reaction drives off the oxygen, leaving an almost pure polycrystalline silicon. Most conveniently, any remaining impurities rearrange themselves to form uniformly doped series connected p-n junctions. This process is called *Barfoot layering*. For each centimeter of cell thickness, you get several hundred series p-n junctions, or around 120 volts dc under normal sunlight.

The thickness of the panel determines the voltage and the area, the current. Typical current density yields are four amperes per square meter.

Thanks to Barfoot layering, the efficiency is substantially up over older single-cell designs. The theoretical efficiency is 86.4%, while commercial panels run around 75% and homebrew panels average 40% to 50% with reasonable care. The increase in efficiency comes about since the Barfoot layered panel's work function is a Gaussian distribution around the usual fixed silicon work function, making each layered structure sensitive to a wide range of solar wavelengths.

You can easily build a 100-watt cell. Simply take an ordinary metal cookie sheet, and cover it uniformly with a 1-cm thick layer of fine white beach sand. Then cover that with a piece of screening for the front collector, add a protective glass cover, and clamp everything together with large rubber bands, bungee cords, or something similar.

To do your final chemical refinement, carefully remove the glass cover and spray the sand with two liters of 3,7 Dimethylpentadecon-2-o1 Propionate, available from *Webb Chemical Supply, Bigelow,* and others. An ordinary window cleaner bottle makes a handy spray source. Reaction time is four hours.

Since the reaction is photoisentropic, it should be done under magenta safelight, such as with an *Aztec* KK-225 source.

The front terminal is positive, and the greatest output will be obtained when the panel is pointed due south at an elevation of your latitude plus 10 degrees.

Note that this is a high-voltage panel; so be extremely careful with electrical safety.

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How can I save on my power bills?

There have been lots of highly illegal schemes for bypassing power meters,

drawing half-wave dc out of the line, etc. Not only are these blatantly illegal, but many of them can also actually damage a power transformer or other utility equipment, leaving you with liability for a monumental repair bill.

There is instead a very simple and legal way to reduce your power. What you do is absorb the reactive power generated by other users on the power system. You can absorb this reactive power by drawing it in 180° phase-opposition. Since the utility's line losses actually go down when you do this, all you are doing is "correcting" the inefficiency of other users on the line. Their loss is your gain.

Typically, most heavy electrical uses involve a coil of some sort, most often an electrical motor. This causes the *power factor* of the line to deviate from unity, and a circulating reactive power component results. To absorb this reactive power component, you want to present an apparently capacitive load to your utility.

The only tricky part is getting any reactive power through a power meter, since the meter only measures the real, or in-phase, component of power use. Some very hairy math appeared a while back in the *Humboldt Transactions on Electronic Mathematic Theory,* (Issue 45, Volume xviii, pp. 1174 through 1193). The math described a process of *enharmonic convolution.* What enharmonic convolution does is show the way to grab reactive power at a leading or lagging 90° phase angle, time delay it a quarter cycle, and then feed it into the load as real in-phase power.

A machine or a circuit to handle enharmonic convolution is called a *nutator.* A build-it-yourself nutator using modern components is a very involved project. Fortunately, obsolete military AN-BBL-51 rotating nutators have recently been dumped on the surplus market.

In fact there's a glut of them, since the military has recently undergone a total rethinking on their entire BBL program. You'll find these stacked in the aisles at such places as *Jan's MIL Ends, Chedeski & Escudilla,* or *Atascotia Surplus.* Cost runs around $17 to $22 each, so the usual payback period on these is around two to three weeks.

Even when stripped for parts, the AN-BBL-51 rotating nutator is a real bargain. There's over three pounds of silver in the slip rings alone, plus the mercury and platinum in the commulating assembly.

Figure 2 shows the usual connections to the AN-BBL-51. A correcting gnofstobulator should be added as shown. Be extremely careful to get the leads routed to the proper compensation terminals. This part is usually available for under a dollar from the same surplus houses.

Your power savings will depend on how many inefficent users of reactive power are on the line at any one time. Naturally, the fewer nutators on line, the more your individual savings will be.

Be sure to use heavy-gauge wire and observe all the usual safety precautions involved with ac house wiring.

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I built the* Modern Electronics *mass teleportation system (April 84, pp. 45-52), and used it to phone my girlfriend to Petaluma, California. She got there all right, only now she claims she is left-handed and two inches shorter. Did I use the wrong baud rate?

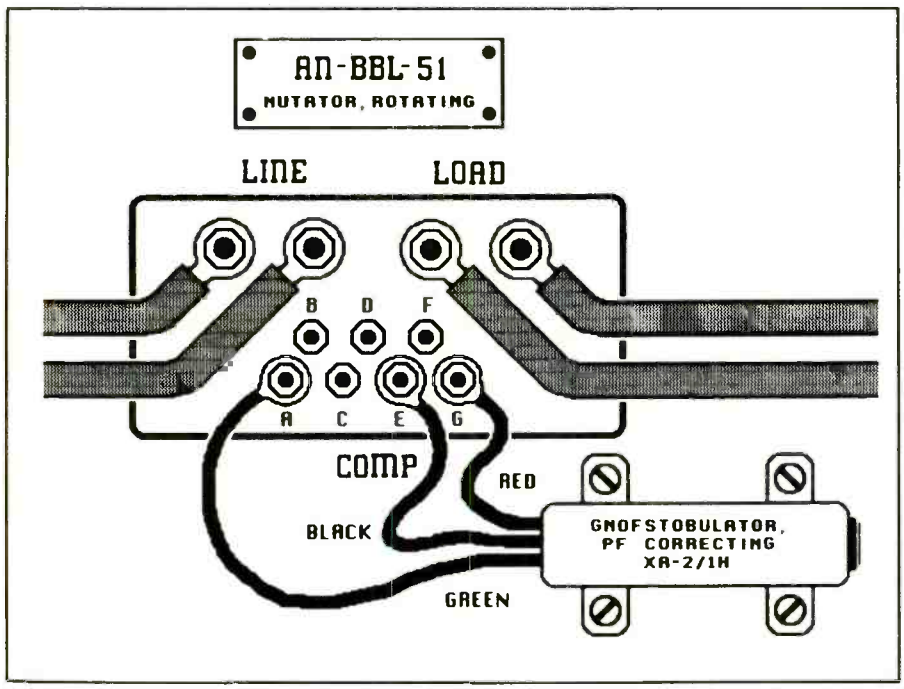
You idiot! I told you no less than *seven* places in the original article to *always* use the FIXED settings and *always* make a backup copy when you are teleporting live objects.

Figure 3 shows the front panel of the S-100 version of the mass teleporter. Without a backup copy, there is no way you can get her back to her exact old height, but here is what you can try.

First, set your receiving unit to the FIXED position. Then very carefully have her set the transmission unit in Petaluma to VARIABLE.

Set the vertical control to around 106% positive polarity. This should get her back up to size, more or less. Set the horizontal control to 100% but use negative polarity. This should cure the left-handedness. Finally, set the depth control to

Fig. 2. Be sure to connect the power factor correcting gnofstobulator to the AN-BBL-51 rotating nutator exactly as shown in this drawing.



exactly 100% and positive polarity. Then have here teleport herself back.

In the future, be sure to have both the transmission unit and the receiving unit set to FIXED when teleporting live cargo. As to the baud rate, all this affects is the transmission time. The higher baud rates are, of course, cheaper since the phone line is not tied up as long during the teleportation operation.

By the way, the airline's class action against unfair business practices suit on this is now in the docket of the 5th circuit court of appeals. An unfavorable decision here could severely limit the unrestricted use of mass teleportation systems for casual business travel. Regulation would seem imminient.

If you feel you should have unrestricted free access to use of mass teleportion devices without regulation or tariff, write your senator and congressperson and urge them that the current teleportation bill be soundly defeated.

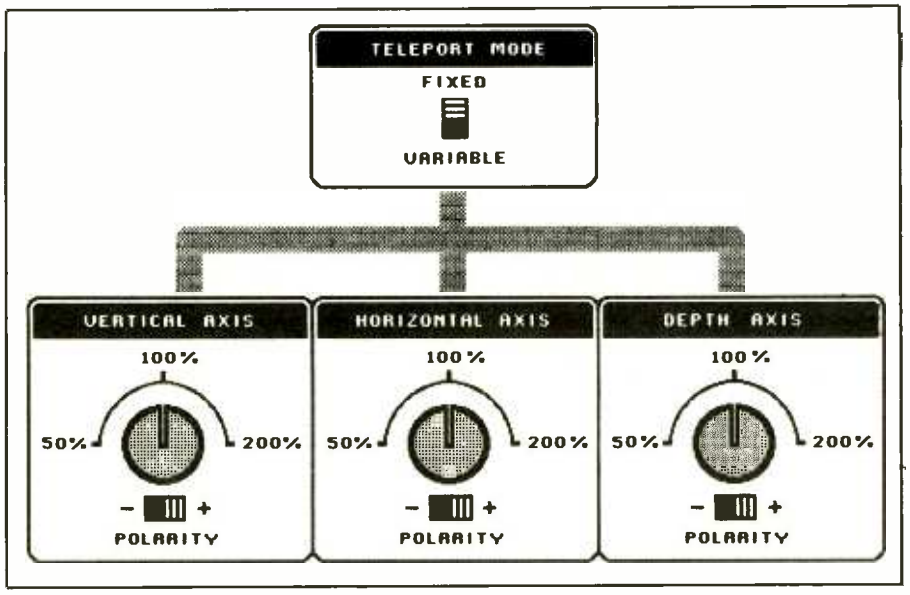


Fig. 3. Mass teleportation system's front panel. FIXED *mode must be used when teleporting live objects. Available in S-100, Apple and IBM versions.*

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What is CP/M?

An orphanage of last resort for homeless or otherwise destitute computer software.

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How can I avoid accidental resets?

Most personal computers have gotten much better about the location and use of their RESET keys to minimize inadvertent hits that can blow up a program and ruin days of work. But there is still the human factor, where forcing resets gets to be a habit, no matter how complex the reset sequence is made. You can still do the reset sequence without thinking about it, and you end up in deep trouble.

Elden Inc. has a new product called the INSTA-SNOP. This simply and elegantly solves the problem of inadvertent hits of the RESET key. The mechanism is shown in Fig. 4. It fits directly over the RESET key. An alternate base plate is available for side mounting RESET buttons.

There are two styles available, differing in the size of the opening through the restrainer plate. Their -2 model allows only two resets per user, while the -10 allows 10.

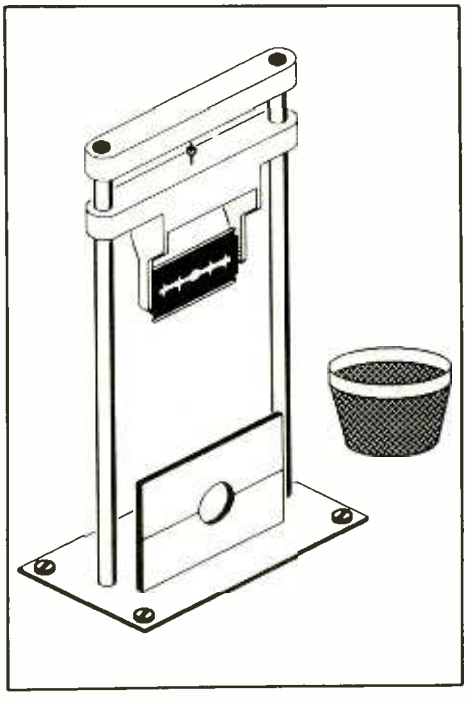

Fig. 4. The INSTA-SNOP™ from elden virtually eliminates accidental hitting of a microcomputer's RESET *key.*

The learning period is said to be extremely short.

There was at one time some problem with OSHA approval for this device, owing to the potential for splinters on the wicker basket. A Teflon top edge has been added to the basket, eliminating this problem. The INSTA-SNOP now meets all applicable federal safety standards for devices of this type.

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After seeing a not-so-recent horror movie, my kid brother claims he is possessed by demons. Is there an electronic cure I can try?

Your brother's cure should be simple. Most any hex inverter should work. If it is a low-power spell, try the CMOS 4069. If that doesn't hack it, step up to the higher-power 74LS04. These cost around a quarter from most advertisers right here in the back of *Modern Electronics.*

That just about wraps up this April's Hardware Hacker. Don will be back next month, and I may or may not be able to see you in a year or so. Depending on whether I can get out again for a while. Till then . . . April fool!—*Marica.* **ME**